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A Memorandum Report on the Application of CALSIM II Model At 2001 Level-of-Development

(A supplement to the Memorandum Report on 2020 LOD issued in August 2001)

California Department of Water Resources,
Office of State Water Project Planning
And
United States Bureau of Reclamation, Mid Pacific Region
Division of Planning
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I Purpose of the Report

The purpose of this supplemental memorandum report is to demonstrate the application of the CALSIM II model at the 2001 level-of-development simulating the Interior's October 5, 1999 (b)(2) Decision[1] and the Environmental Water Account (EWA) under CALFED ROD/Framework regulatory environment.

Like 2020 study the modeling study presented in this report is also an example study. The results of the study are intended to show the capability of the model to simulate the complex project operations rules and criteria. It is not a standard baseline study and neither DWR nor USBR recommends the results of this study be used beyond the limited purpose of this report.

The model is usually intended to be used in a comparative mode. The results from a "with project" simulation should be compared to the results of a baseline simulation to obtain the incremental effect of a project on the system. The results from a single simulation may not necessarily represent the exact operations for a specific month or year, but should reflect long-term trends.

Formulation of the CVPIA(b)(2) and EWA criteria and the resulting operations of the two projects will likely be refined with input and suggestions from the interested parties to carry out a more specific study to meet a particular need in the future.

II Example Model Study

An example model study has been completed at the 2001 level-of-development simulating assumed operation criteria under CVPIA (b)(2) and the concept of EWA as discussed in the 2020 LOD report. All modeling assumptions used in the 2001 LOD study are unchanged from the ones used in the 2020 study. Appendix A of the same report presented the general modeling assumptions. Same appendix also compared the regulatory standards, in-stream flow requirements, and other operational constraints between the Decision 1485, Decision 1641, CVPIA (b)(2) proposed fish actions and EWA imposed additional fish protection measures. For the 2001 level study, a new joint hydrology was developed by the Department and the Bureau staff modeling. The SWP and CVP annual demands imposed in this simulation study are :

- SWP south-of-Delta demand was assumed to vary from 2.7 maf to 3.9 maf/yr.
- SWP north-of-Delta demand was assumed to be 830 taf/yr.
- CVP south-of-Delta demand was assumed to be 3.5 maf/yr.
- CVP north-of-Delta Sacramento River demand was assumed to be 2.8 maf/yr.
- CVP American River demand was assumed to be 289 taf/yr. based on the Water Forum 2000 demand.
- Stanislaus River demand was assumed to be 680 taf/yr.
- Contra Costa Water District demand was assumed to be 140 taf/yr.

1. Department of the Interior Decision on Implementation of Section 3406 (b)(2) of the Central Valley Project Improvement Act.

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V Example Study Key Modeling Results

This section presents key results regarding project water supply capabilities, project operations as well as CVPIA (b)(2) and EWA operations as simulated by the model.

V.1. Water Supply

Table V.1.1
Water Supply
(taf/year)

Delivery	(May 1928 - Oct. 1934) Dry Period Average	(1922-1994) 73-Year Period Average
Total SWP south-of-Delta Firm Delivery	1817	2747
Total SWP Interruptible Delivery	55	215
Total CVP north-of-Delta Delivery	2029	2240
Total CVP south-of-Delta Delivery	1665	2206
Total CVP south-of-Delta Agricultural Delivery	358	793
Total Delivery	5566	7408

Table V.1.1 shows the average annual deliveries for the SWP and CVP for the historical dry period of 1928 through 1934 and 73-year long-term. The average annual SWP south-of-Delta firm delivery in the dry period of 1928 through 1934 is 1,817 taf and 2,747 taf long-term. The average annual SWP interruptible delivery in the dry period of 1928 through 1934 is 55 taf and 215 taf long-term. The average annual for CVP south-of-Delta delivery in the dry period of 1928 through 1934 is 1,665 taf and 2,206 taf long-term. The average annual CVP north-of-Delta delivery in the dry period of 1928 through 1934 is 2,029 taf and 2,240 taf long-term. The average annual CVP south-of-Delta agricultural delivery in the dry period of 1928 through 1934 is 358 taf and 793 taf long-term.

Figure V.1.1

Frequency of Total SWP south-of-Delta Firm Delivery Reliability

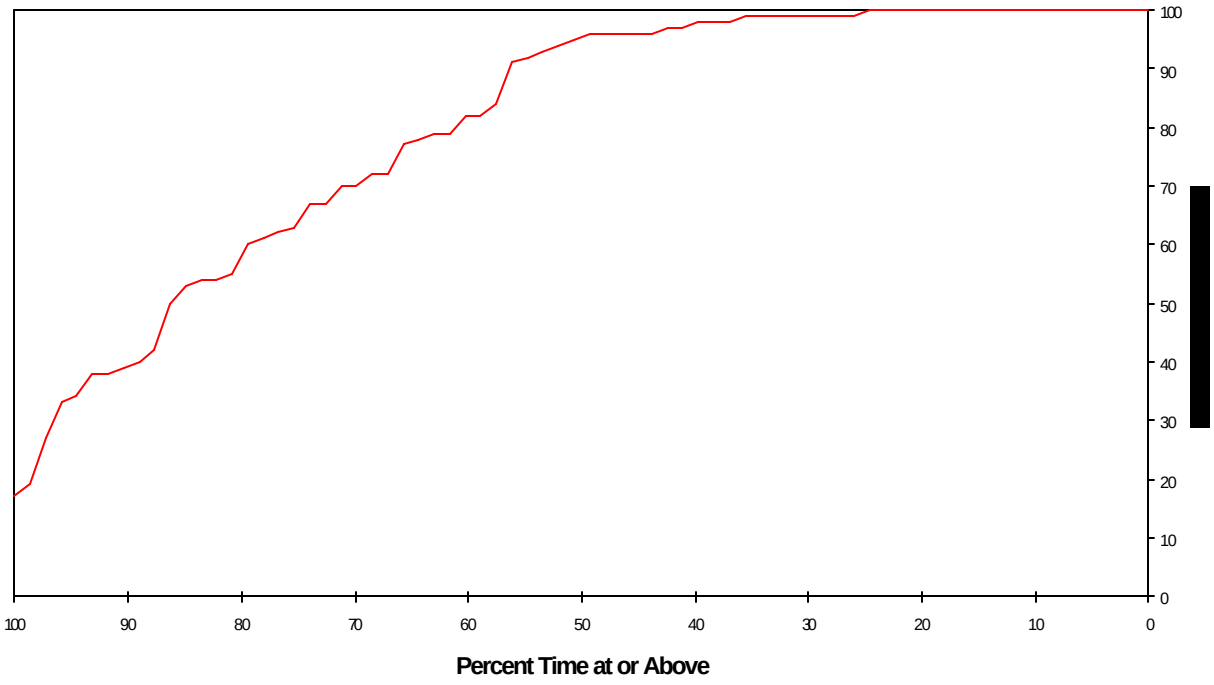

Figure V.1.1 shows the frequency of total annual SWP south-of-Delta firm delivery reliability. In 50 percent of the years, about 95 percent of the SWP south-of-Delta firm demand is met.

Figure V.1.2
Frequency of SWP Interruptible Delivery

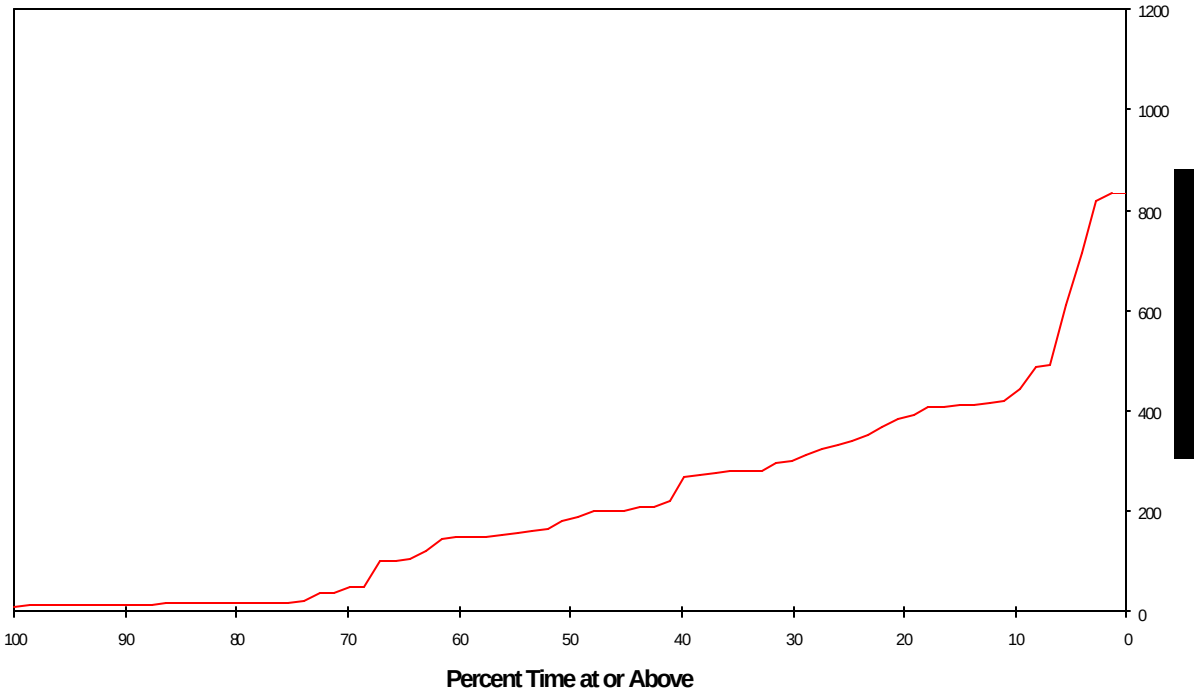

Figure V.1.2 shows the frequency of total annual SWP interruptible delivery. In about 50% of the years, the total annual interruptible delivery is at least 180 taf. The average annual interruptible delivery is 215 taf.

Figure V.1.3
Frequency of Total CVP south-of-Delta Delivery

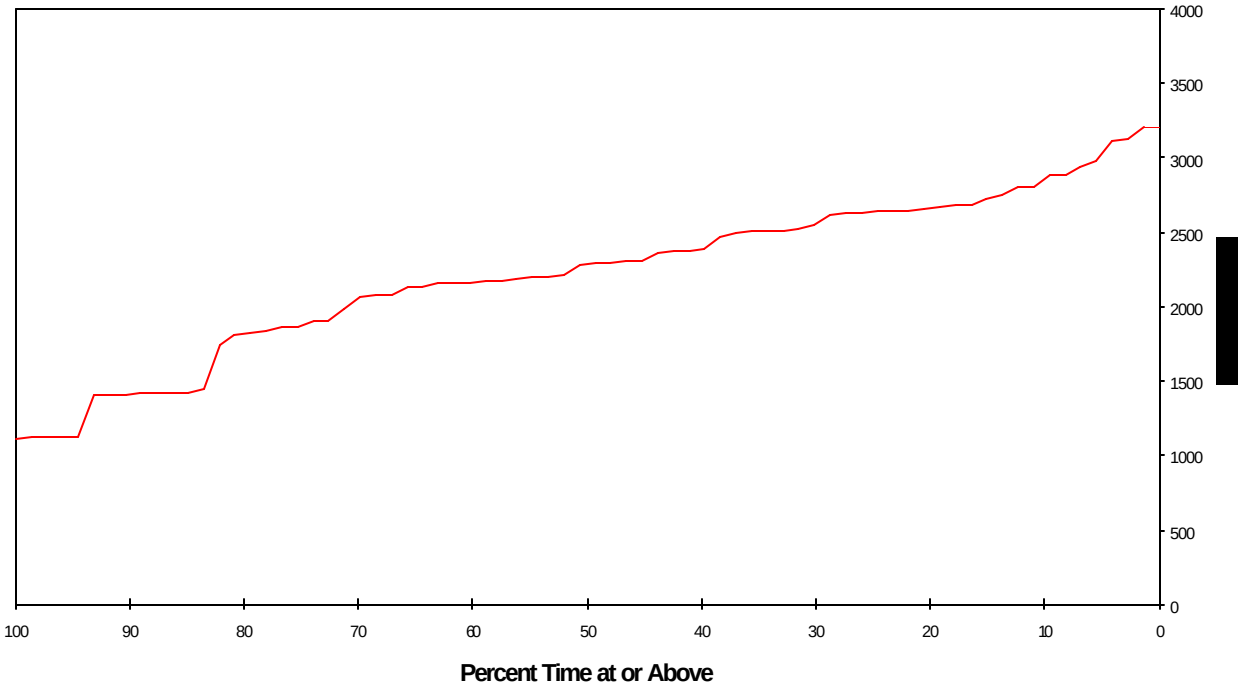

Figure V.1.3 shows the frequency of total annual CVP south-of-Delta delivery. In 50 percent of the years, the total annual CVP south-of-Delta delivery is at least 2,280 taf. The average annual CVP south-of-Delta delivery is 2,206 taf.

Figure V.1.4
Frequency of Total CVP south-of-Delta Agricultural Delivery

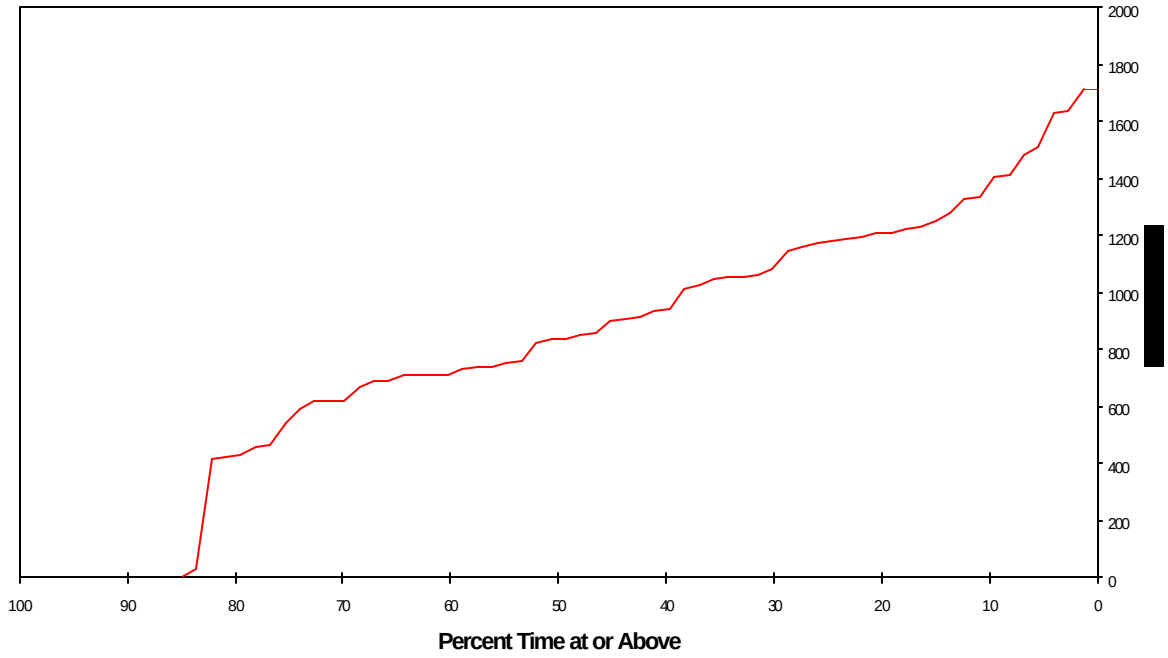

Figure V.1.4 shows the frequency of total CVP south-of-Delta delivery to agricultural contractors. In 50% of the years, the total annual CVP south-of-Delta delivery to agricultural contractors is at least 820 taf or 42 percent of the full allocation. The average annual CVP south-of-Delta delivery to agricultural contractors is 793 taf.

Figure V.1.5
Frequency of Total CVP north-of-Delta Delivery

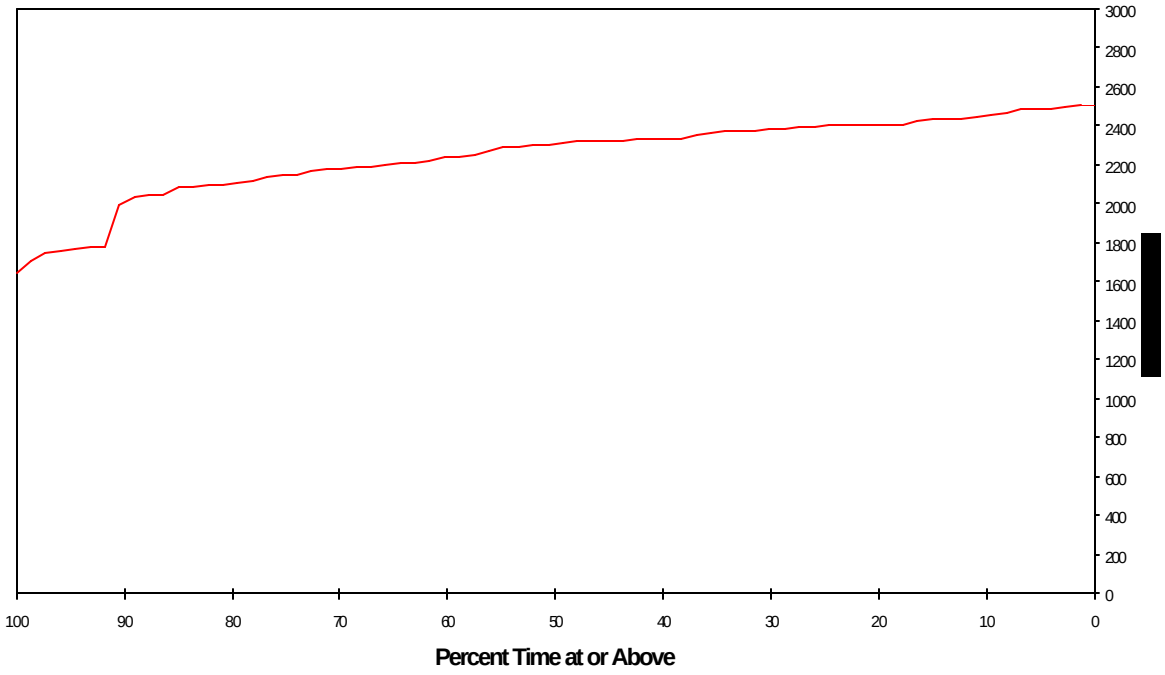

Figure V.1.5 shows the frequency of total CVP north-of-Delta delivery. In 50% of the years, the total annual CVP north-of-Delta delivery is at least 2,300 taf. The average annual CVP south-of-Delta delivery to agricultural contractors is 2,240 taf.

V.2. CVPIA (b)(2) Operations

Figure V.2.1
Total End of Year (b)(2) Costs

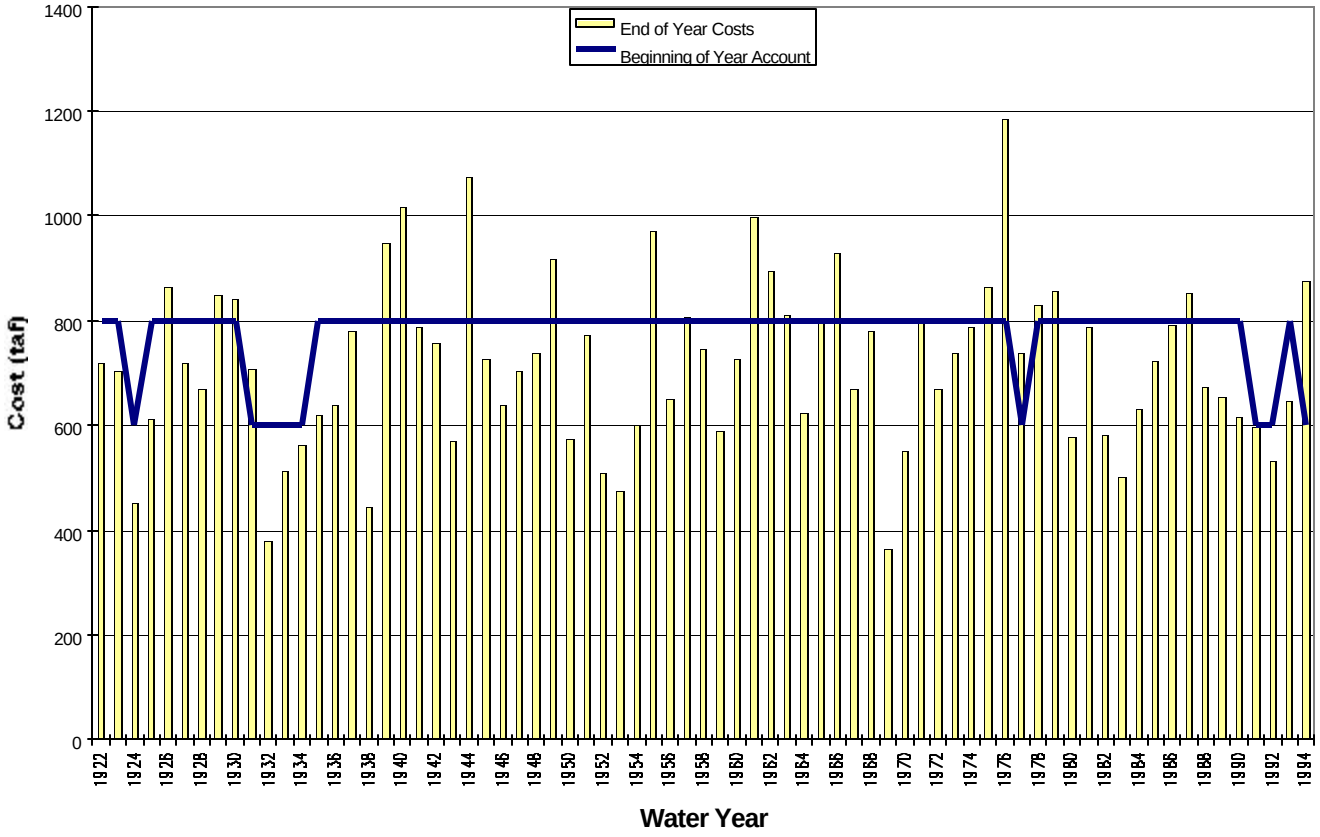

Figure V.2.1 shows the total end of year (b)(2) costs and the beginning of year (b)(2) account. The blue line shows the total (b)(2) account limit at the beginning of each year (800 taf in normal years, 600 taf in Shasta critical years). The bars show the actual total end of year (b)(2) costs for each year. There are twenty years out of the 73-year study period in which the total (b)(2) cost exceeded the (b)(2) account. The total (b)(2) costs exceeded the (b)(2) account limit because of several reasons: 1. CALSIM is a monthly time-step model and will impose a (b)(2) action as long as there is a balance in the (b)(2) account at the beginning of the month. When a (b)(2) action is imposed, it is imposed for the entire month, and the action taken resulted in a cost more than the remaining (b)(2) account balance; 2. Export differences due to different operations in July through September period between the (b)(2) study and the WQCP study result in a (b)(2) cost even though no (b)(2) action is taken in the July through September period. Conversely, there are many years when the total (b)(2) cost is less than the (b)(2) account limit as shown in the chart. In those years, all of the eight (b)(2) actions are taken, but the total cost of those actions is less than 800 taf or 600 taf (b)(2) account. In these years, either the (b)(2) actions did not cost much or the WQCP cost is negative.

Figure V.2.2
Total Annual WQCP Costs

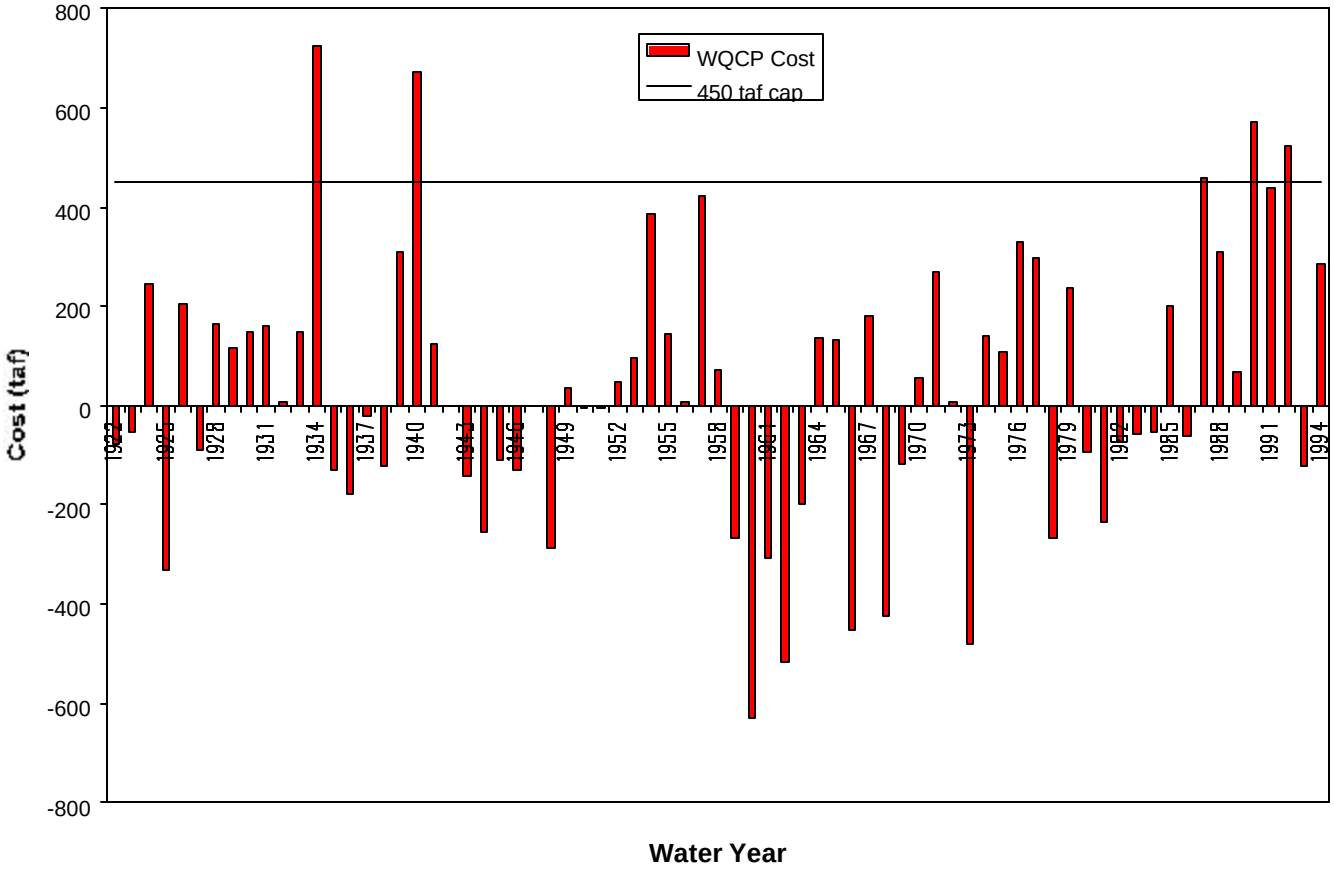

Figure V.2.2 shows the total annual CVP WQCP costs. This is the total cost to the CVP due to regulatory requirements of the WQCP. The cost is computed from the WQCP study with D1485 as the baseline. There are five years in which the WQCP costs exceeded the 450 taf cap. In the (b)(2) accounting procedure, only up to 450 taf of CVP WQCP cost provided to meet the WQCP requirements is charged to the (b)(2) account. There are thirty years in which the WQCP cost is less than D1485 because of differences in Delta outflow requirements, water-year type classifications, export constraints, or ANN requirements.

Figure V.2.3
Percent of Time (b)(2) Actions Taken

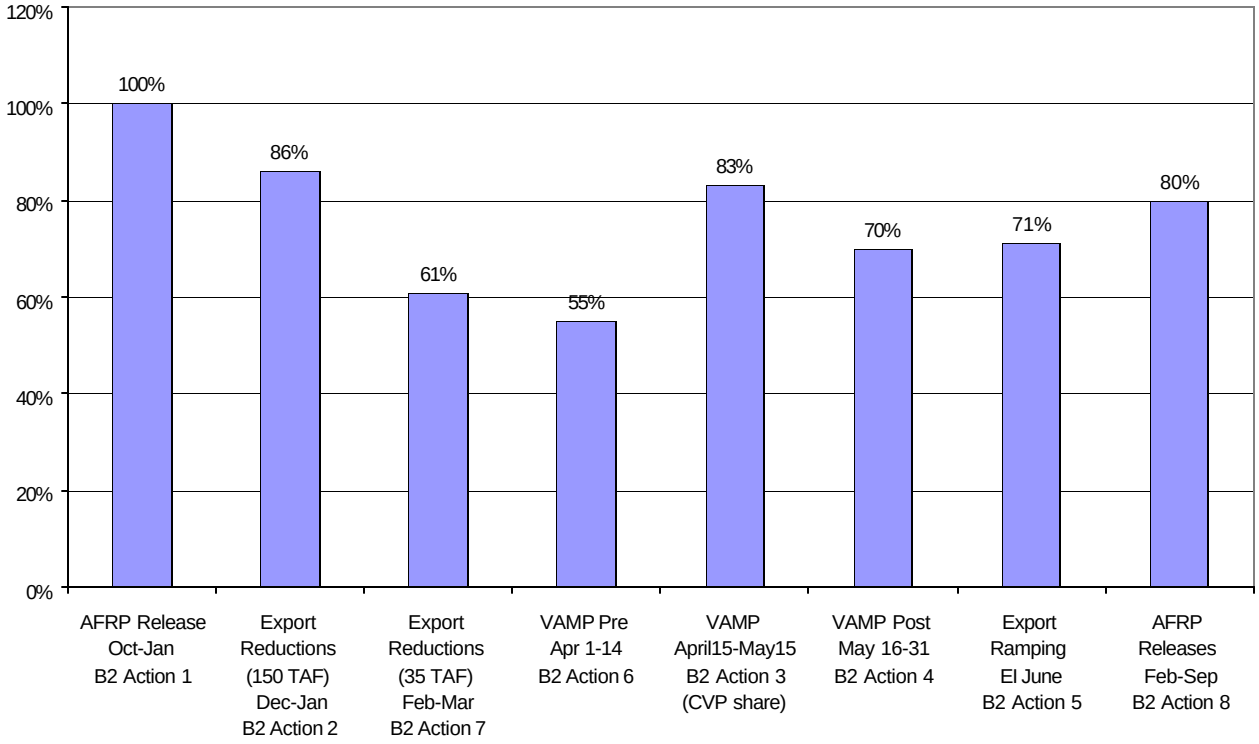

Figure V.2.3 shows the percent of time (b)(2) actions are taken for the 73-year study period. The (b)(2) actions are imposed on the CVP system only. The (b)(2) action that is most frequently taken is Action 1 (AFRP releases in October through January) at 100%. The second most frequently taken action is Action 2 (December and January export reductions) at 86%. The next most frequently taken action is Action 3 (VAMP) at 83%, followed by Action 8 (AFRP releases February through September) at 80%. The percent of times the remaining actions as follows: Action 4 (post-VAMP 16 through 31 May) at 70%, Action 5 (June EI ramping) at 71%, Action 7 (35 taf export reduction February and March) at 61%, and Action 6 (pre-VAMP 1 through 4 April) at 55%. The reason that Action 2 (December through January export reductions) is taken more frequently than Action 3 (VAMP) is due to the reserve amounts used to trigger Action 2. The reserve amounts need to be refined so that there will be less Action 2 taken and more (b)(2) water left to do Action 3.

V.3. EWA Operations

Figure V.3.1
Percent of Time EWA Actions Taken

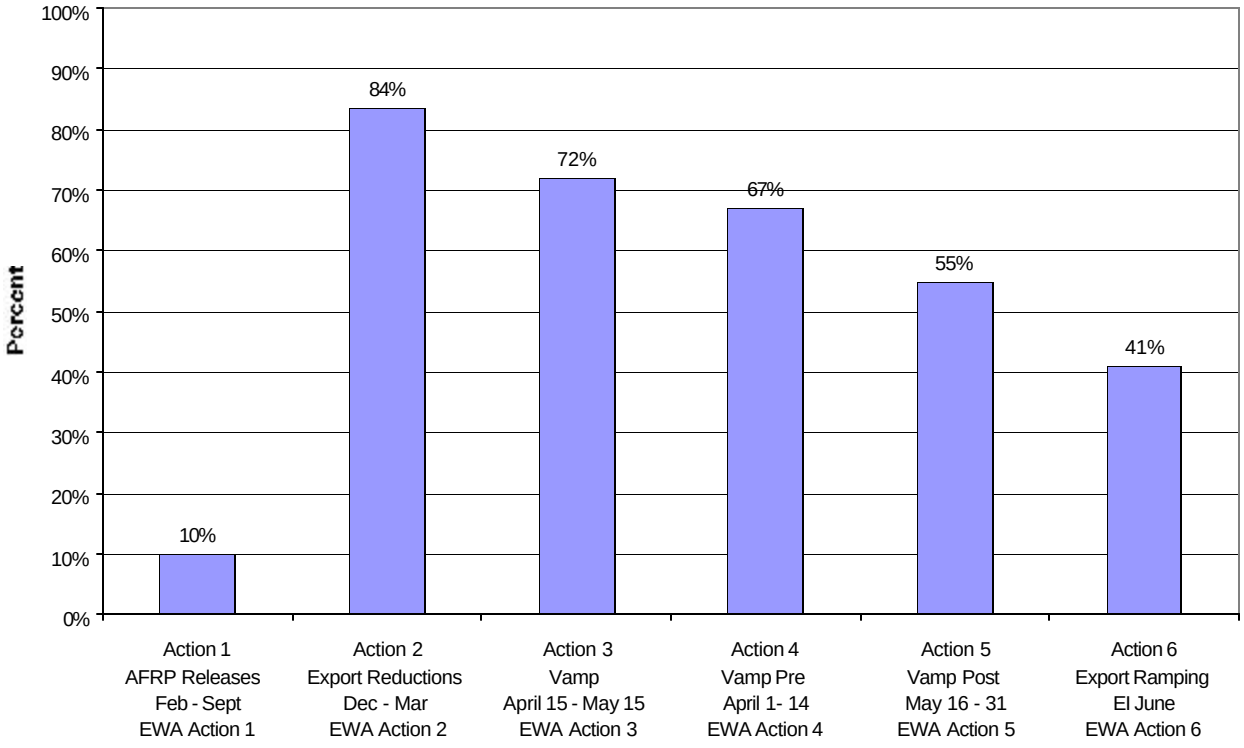

Figure V.3.1 shows the percent of time EWA actions are taken. While the (b)(2) actions are imposed only on the CVP system, EWA actions are imposed on both the SWP and CVP systems. Four of the EWA actions are the same as the (b)(2) actions. The EWA would impose actions only on the SWP if (b)(2) actions were imposed on the CVP. However, if (b)(2) actions were not imposed on the CVP because the (b)(2) account is exhausted, then the EWA will impose actions on both the CVP and SWP as long as the EWA has sufficient collateral to repay the debt to the projects. The EWA action most frequently taken is Action 2 (Dec-Mar export reduction) at 84% of the time. The next most frequently taken action is Actions 3 (VAMP) at 72% of the time, followed by Action 4 (pre-VAMP 1 through14 April) at 67% of the time. The percent of time the remaining EWA actions taken are as follows:

Action 5 (post-VAMP 16 through 31 May) at 55% of the time, Action 1 (AFRP releases from February through September) at 10%, and Action 6 (June EI ramping) at 41% of the time.

Figure V.3.2
Percent of Times (b)(2) and EWA Actions Taken

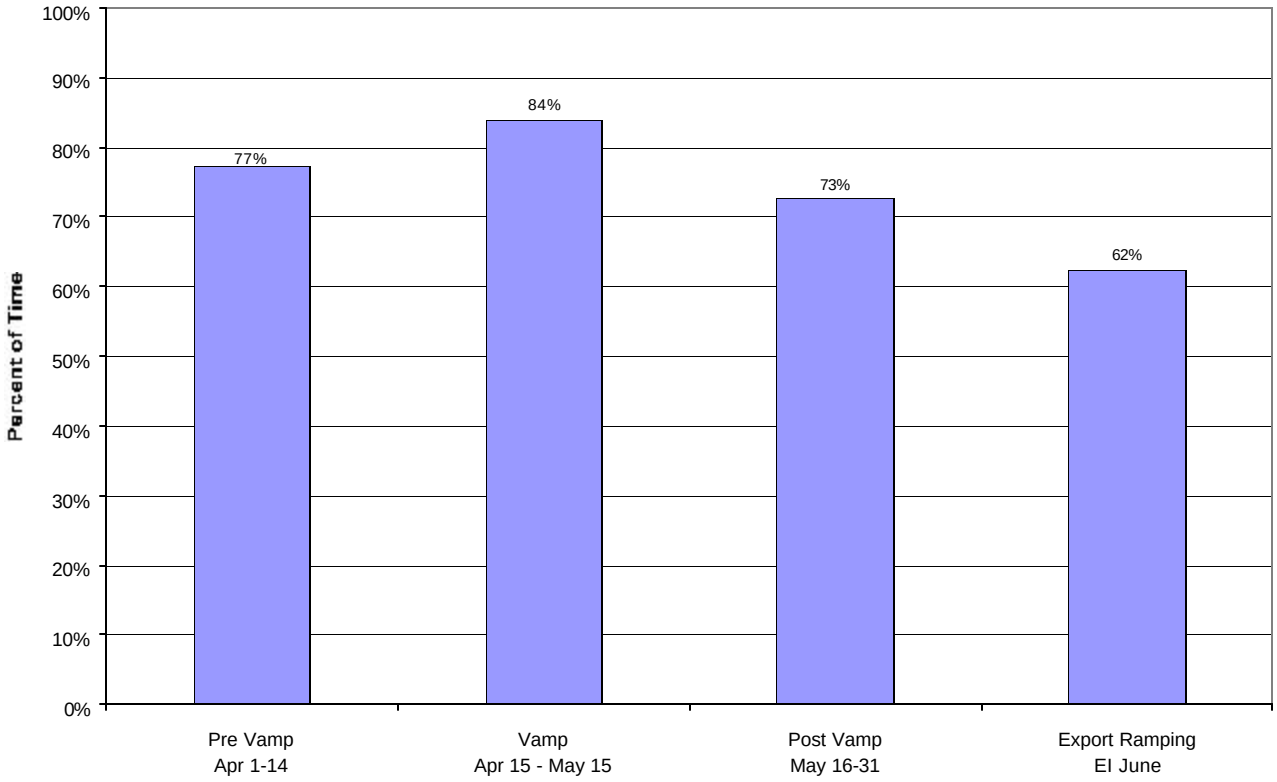

Figure V.3.2 shows the percent of time (b)(2) and EWA actions are taken. The actions are common to (b)(2) and EWA. These are percent of times when:

- (b)(2) actions are taken on the CVP, and EWA actions are taken on the SWP (this qualifies as one full action taken)
- no (b)(2) action is taken on the CVP, but EWA actions are taken on both the SWP and CVP (this qualifies as one full action taken)
- or (b)(2) actions are taken on the CVP, and EWA does not take actions (this qualifies as one half action taken)

The most frequently taken (b)(2)/EWA action is VAMP at 84% of the time. The next most frequently action taken is pre-VAMP at 77% of the time, followed by post-VAMP at 73% of the time, and June EI export ramping at 62% of the time.

Figure V.3.3
Frequency of Joint Point Use for EWA
(Includes 500 cfs July through September)

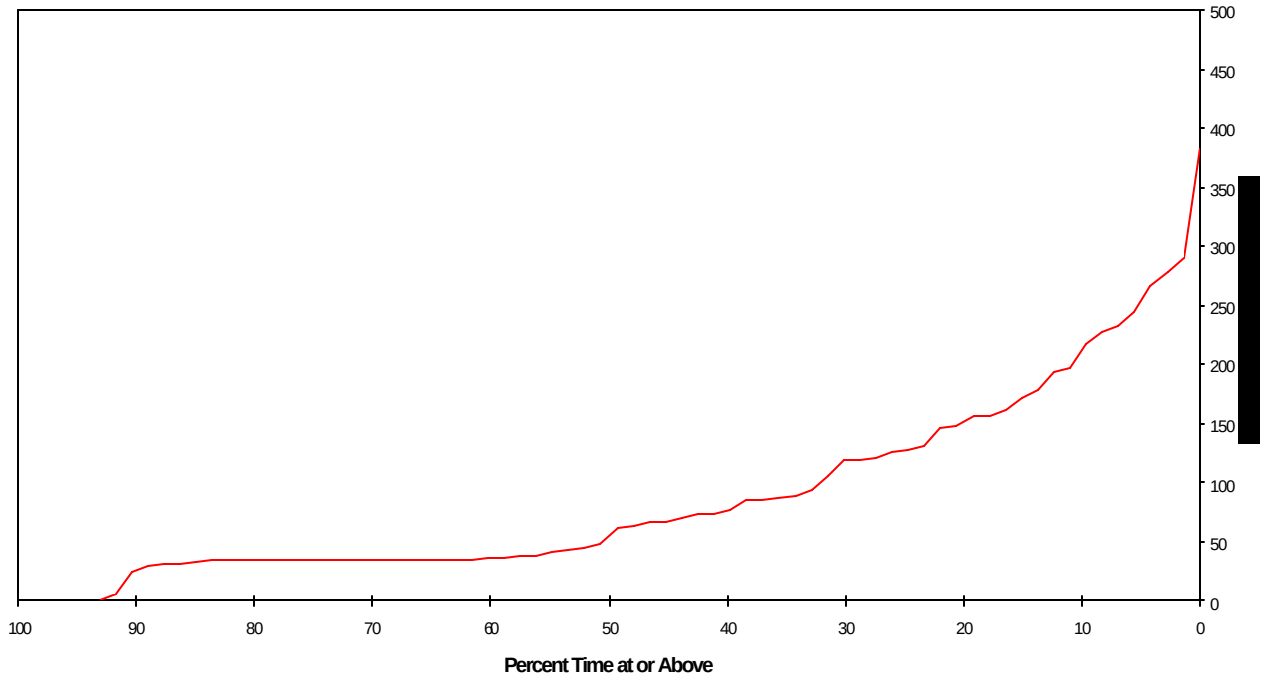

Figure V.3.3 shows the frequency of total annual use of joint-point-of-diversion for the EWA. This represents the total use of joint-point-of-diversion at Banks Pumping Plant to export water for the EWA, including a north-of-Delta purchase, EWA water stored in north-of-Delta project reservoirs, and surplus water. The average annual total use of joint-point-of-diversion for the EWA is 90 taf.

Figure V.3.4

EWA Use of 500 cfs Joint Point capacity in July through September

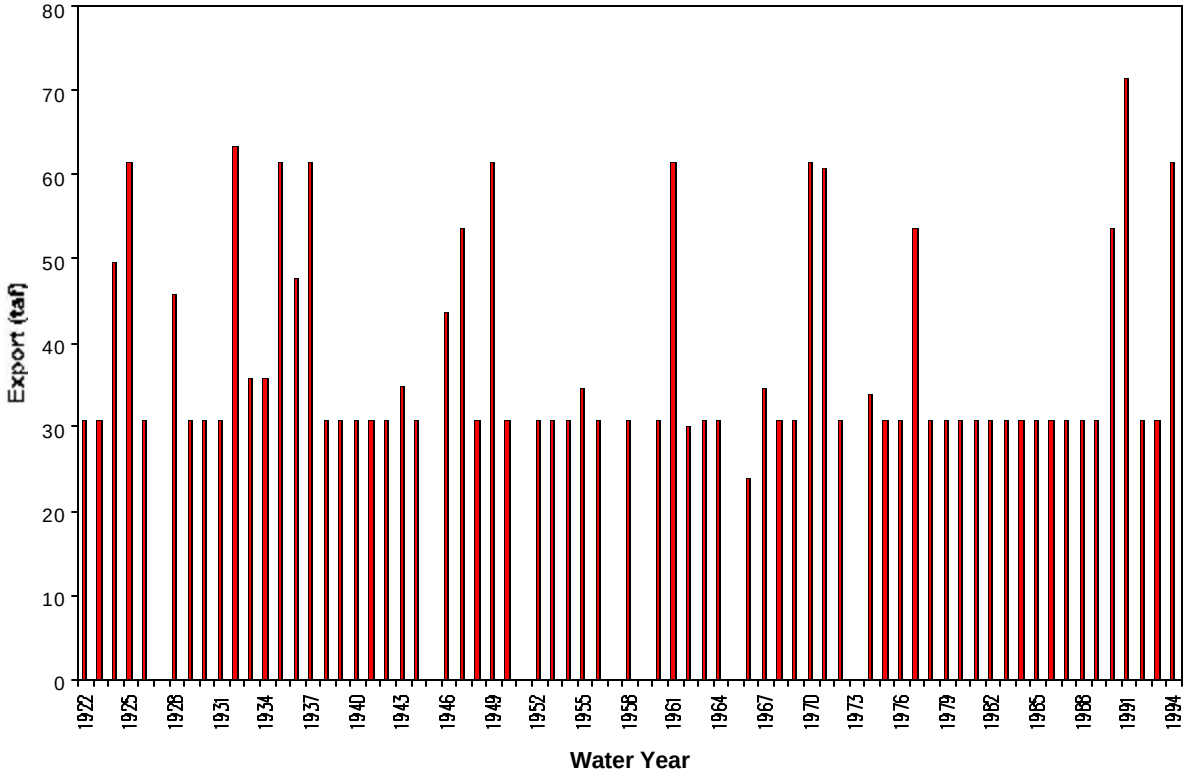

Figure V.3.4 shows total use of 500 cfs additional Banks Pumping Plant capacity in July through September by the EWA to transfer water. There are no years in which the EWA uses the full 500 cfs additional Banks Pumping Plant in all three months. Typically, the EWA uses the 500 cfs capacity to transfer the 35 taf north-of-Delta purchase and EWA water stored in northern project reservoirs. The average annual EWA usage of the additional 500 cfs Banks Pumping Plant capacity is 34 taf.

Figure V.3.5

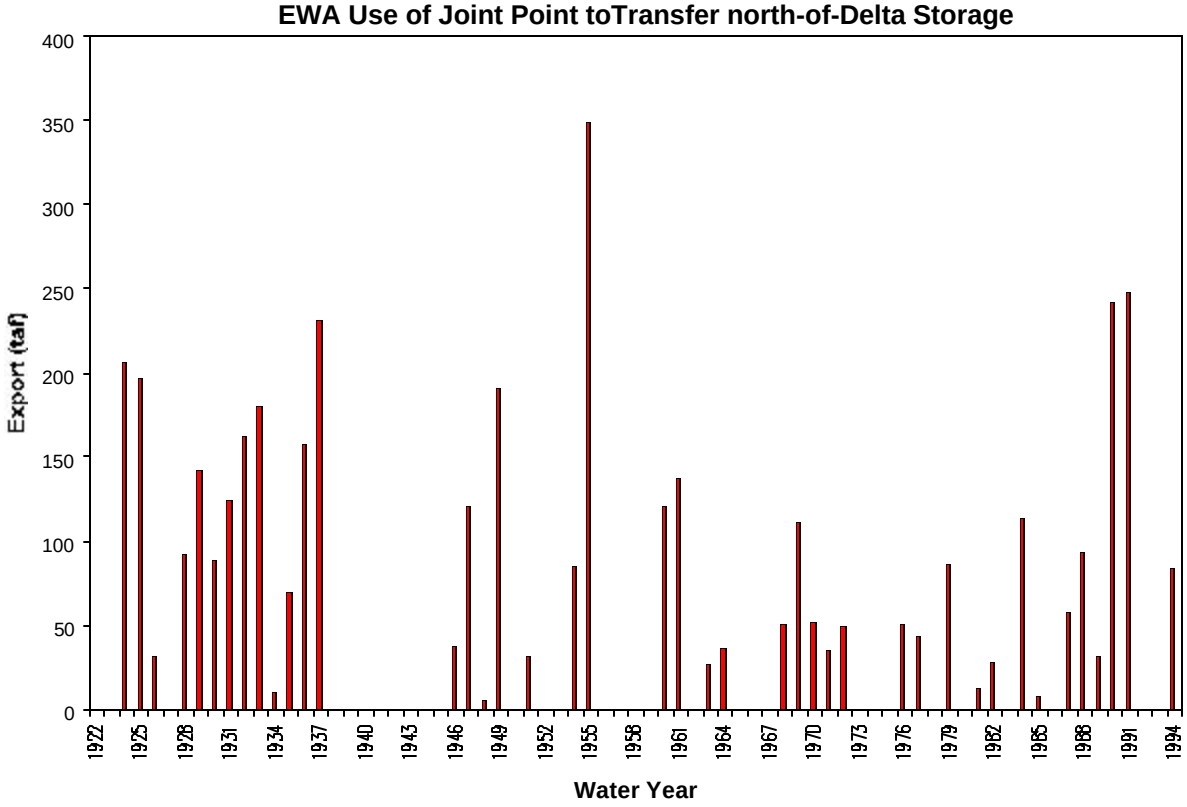

Figure V.3.5 shows total annual transfer of EWA water from north-of-Delta EWA storage into San Luis Reservoir through the use of joint-point-of-diversion through Banks Pumping Plant. When the EWA takes an action to reduce exports, the amount of storage backed up in Lake Oroville, Shasta Lake, or Folsom Lake as a result of EWA imposed export reduction is credited to the EWA account in those reservoirs. The transfer of EWA water from the northern reservoirs is prevalent in dry years because

- EWA storage in northern reservoirs is usually higher in dry years where EWA is less likely to lose its storage account due to flood control spills.
- There is ample joint-point-of-diversion capacity available at Banks Pumping Plant to transfer EWA water in dry years

The average annual transfer of EWA water from north-of-Delta reservoirs to San Luis reservoir is 58 taf.

Figure V.3.6
EWA Assets Utilized

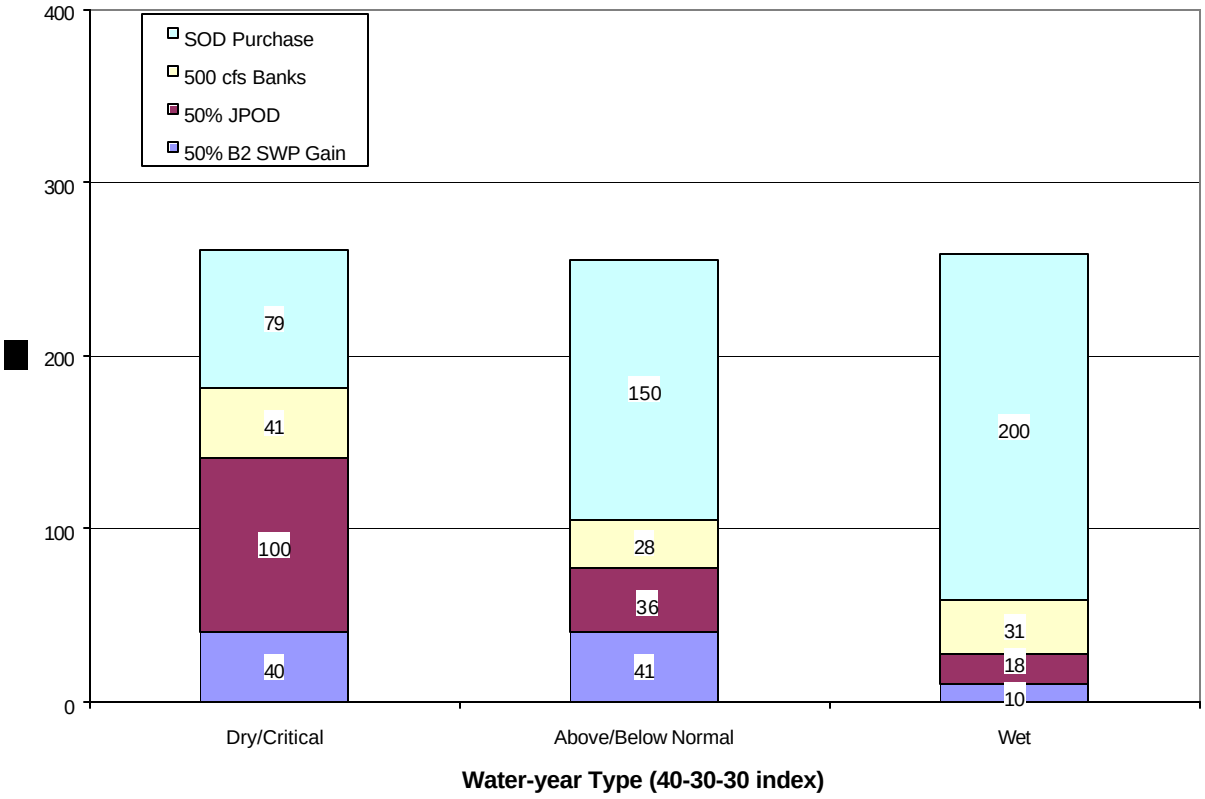

Figure V.3.6 shows EWA assets utilized by water-year type. The assets shown include south-of-Delta purchase, 500 cfs additional Banks Pumping Plant capacity, 50% of joint-point-of-diversion capability, and 50% of (b)(2) SWP gain. The average asset from south-of-Delta purchase is 79 taf/year in dry and critical years, 150 taf/year in above and below normal years, and 200 taf/year in wet years. The average asset from 500 cfs additional Banks Pumping Plant capacity is 41 taf/year in dry and critical years, 28 taf/year in above and below normal years, and 31 taf/year in wet years. The average asset from 50% of joint point of diversion capability is 100 taf/year in dry and critical years, 36 taf/year in above and below normal years, and 18 taf/year in wet years. The average asset from 50% of (b)(2) SWP gain is 40 taf/year in dry and critical years, 41 taf/year in above and below normal years, and 10 taf/year in wet years. These are the major assets that the EWA utilizes to accumulate collateral south-of-Delta so that it can repay debt to the projects when it imposes an EWA action. The 50% of (b)(2) SWP gain and 50% of joint-point-of-diversion may be overestimated because export at Banks Pumping Plant was allowed to increase above the WQCP baseline when a (b)(2) action was imposed.

Figure V.3.7
Unpaid EWA Debt

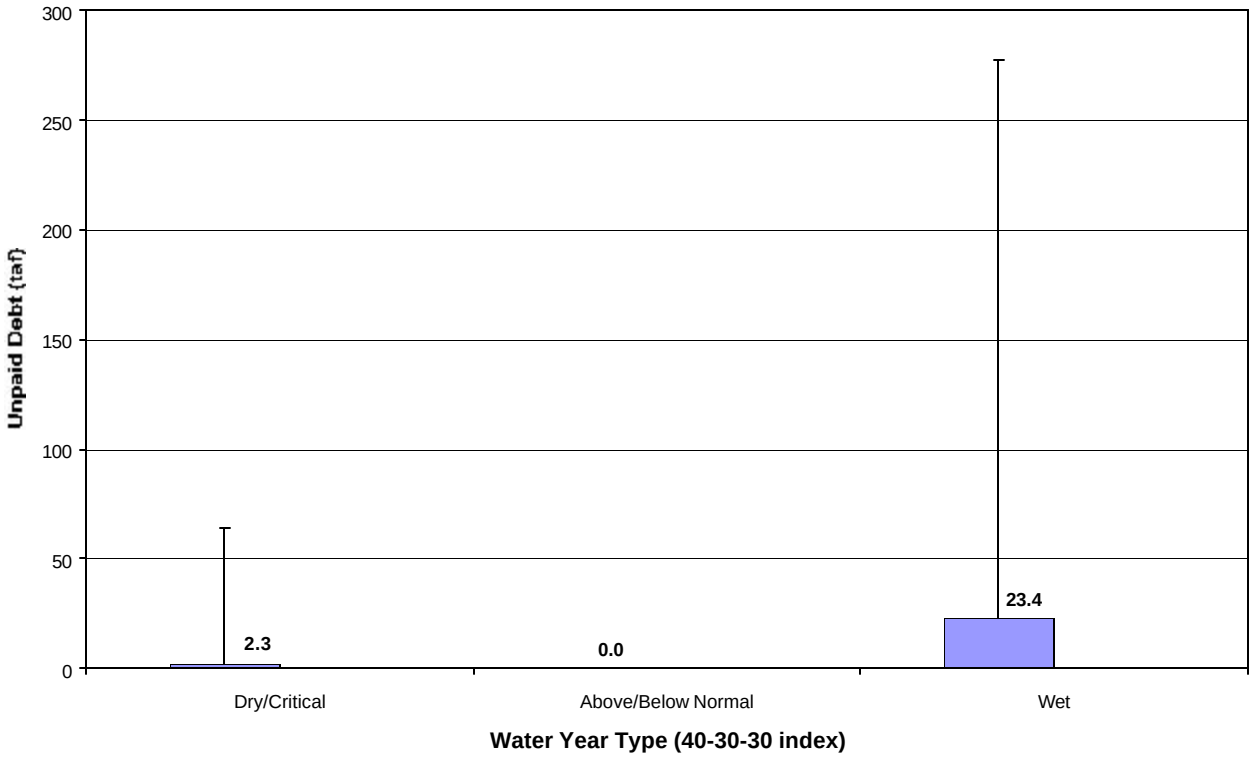

Figure V.3.7 shows the EWA average unpaid debt by water-year type. The bars show the maximum unpaid debt by water-year type. In CALSIM, all EWA debts are repaid to the projects by the end of the water year; the amount of debt that the EWA did not have enough collateral to repay is labeled "unpaid" debt. In actual operations, the EWA could carry the debt to the following year. In the modeling study, this debt was assumed to be paid from an unspecified source. Currently in CALSIM, EWA debt is not carried to the following year. The average annual EWA unpaid debts are 2.3 taf in dry and critical years, 0.0 taf in above and below normal years, and 23.4 taf in wet years.

Figure V.3.8
EWA south-of-Delta Purchase

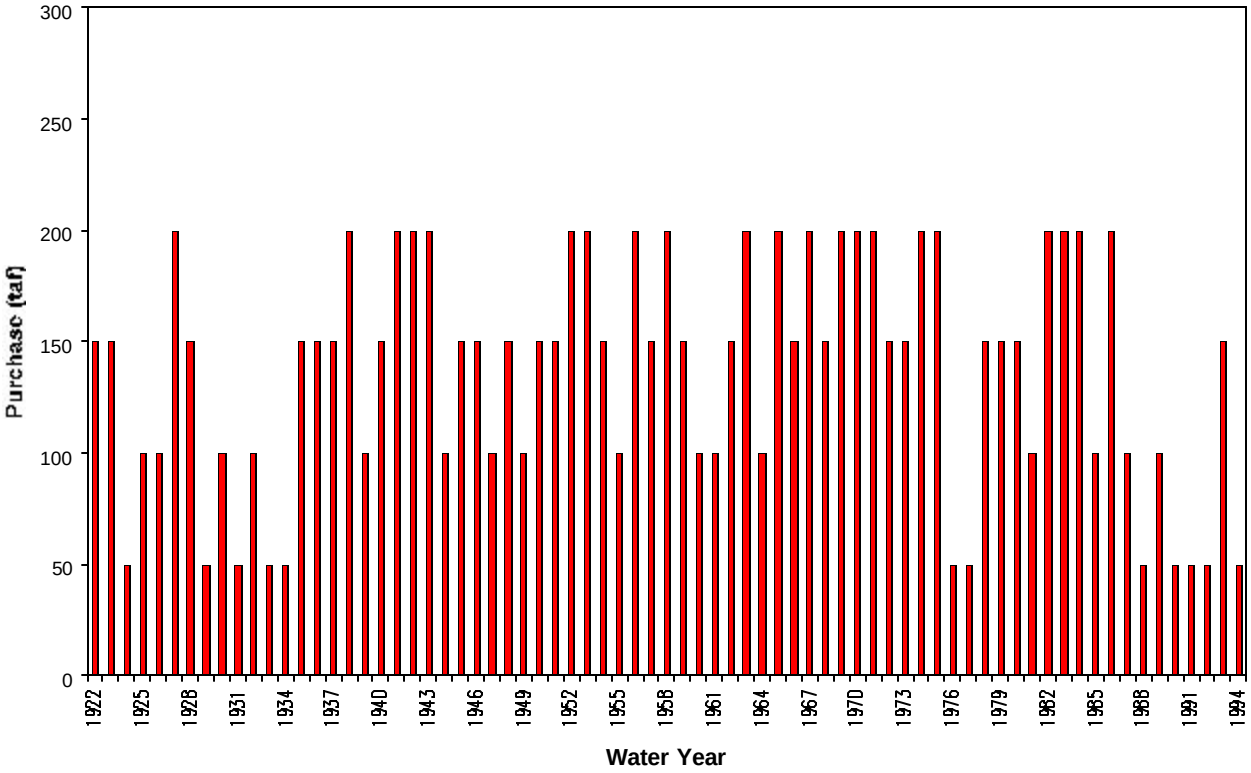

Figure V.3.8 shows EWA south-of-Delta purchase. The purchase amounts are 50 taf/year in critical years, 100 taf/year in dry years, 150 taf/year in above and below normal years, and 200 taf/year in wet years. The EWA uses the purchase water to repay debts to the projects.

Figure V.3.9
EWA Storage in San Luis Reservoir

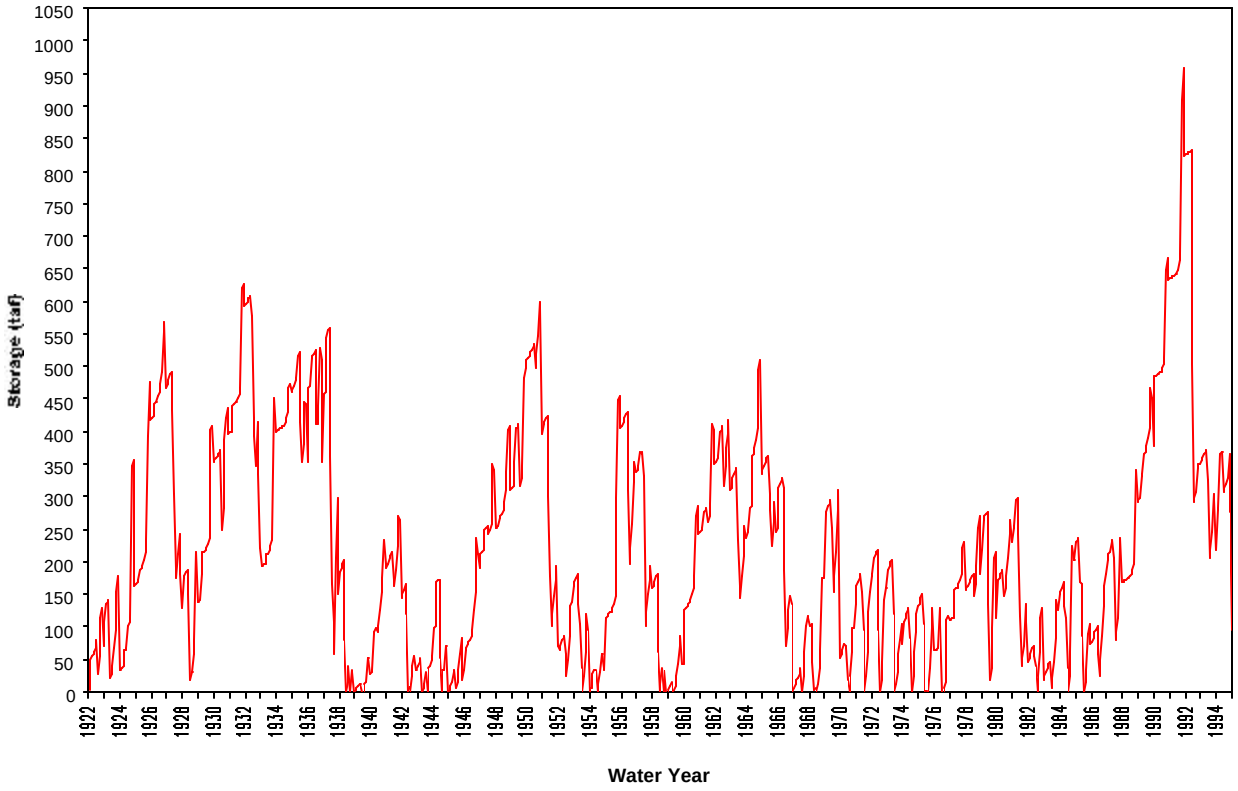

Figure V.3.9 shows EWA San Luis storage. This is EWA's storage account in San Luis Reservoir. This is a part of the south-of-Delta EWA collateral that the EWA accumulates from the various assets. The collateral is used to repay EWA debts to the projects when EWA incurs a debt on the projects by taking an EWA action. EWA will lose its storage in San Luis reservoir if storage is filled. EWA storage is usually high in dry years because:

- During dry years, EWA actions do not cost as much water because baseline deliveries are low. Therefore, EWA does not have much debt to repay to the projects.

- San Luis reservoir has storage capacity available for EWA to store its water. EWA San Luis reservoir does not spill for several consecutive years.

- In dry years, EWA has more opportunity to back up water in Lake Oroville, Shasta Lake, and Folsom Lake because there is less chance of losing that water due to flood control spills from the reservoirs.

- There is plenty of joint-point-of-diversion capacity available at Banks Pumping Plant.

V.4. Trinity River

Figure V.4.1
Trinity Lake Storage

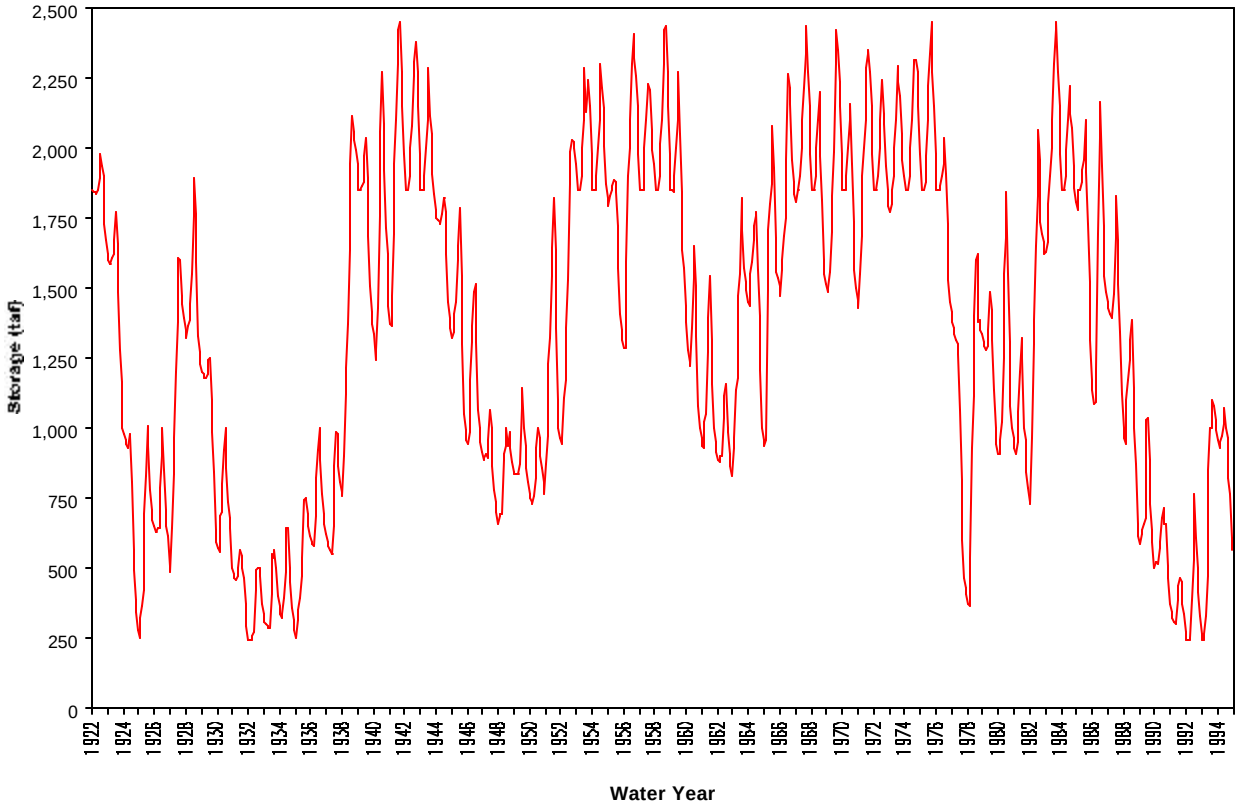

Figure V.4.1 shows Trinity Lake storage. The reservoir is operated to meet the Trinity River minimum required flow and export of water to the Sacramento River system.

Figure V.4.2
Total Annual Trinity River Minimum Instream Flow

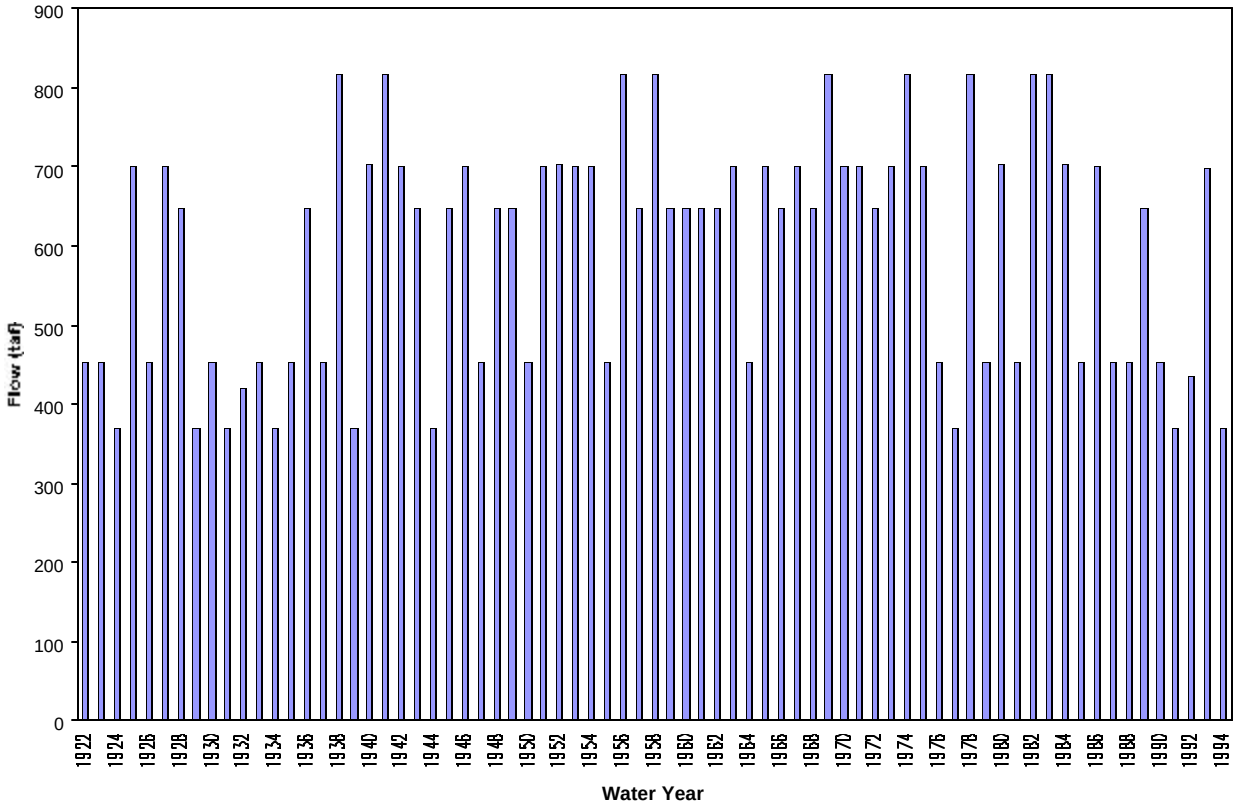

Figure V.4.2 shows the total annual Trinity River minimum instream flow for all years. The flows varied from 369 taf/year in dry years to 815 taf/year in wet years, based on the Trinity River index.

Figure V.4.3
Total Annual Trinity River Export

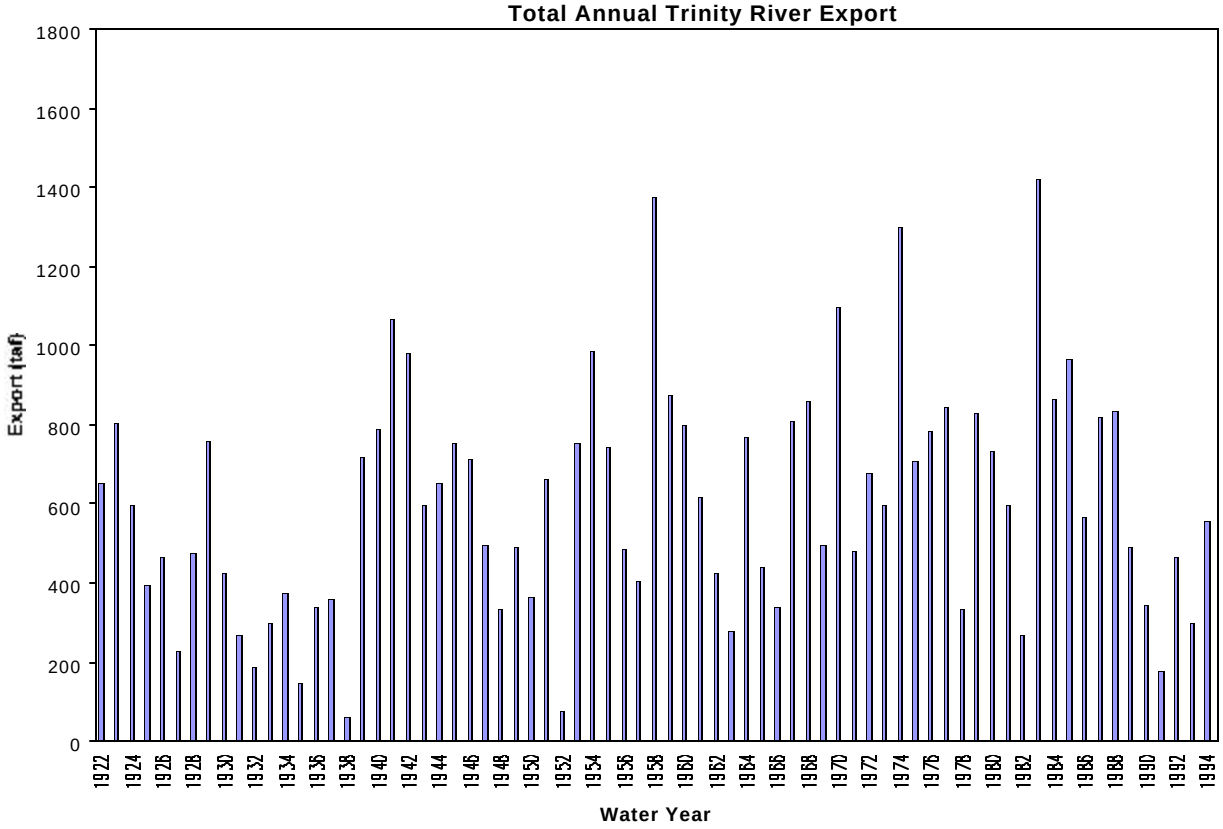

Figure V.4.3 shows the total Trinity River water exported annually to the Sacramento River system. The average annual export is about 604 taf.

V.5. Sacramento River

Figure V.5.1
Shasta Lake Storage

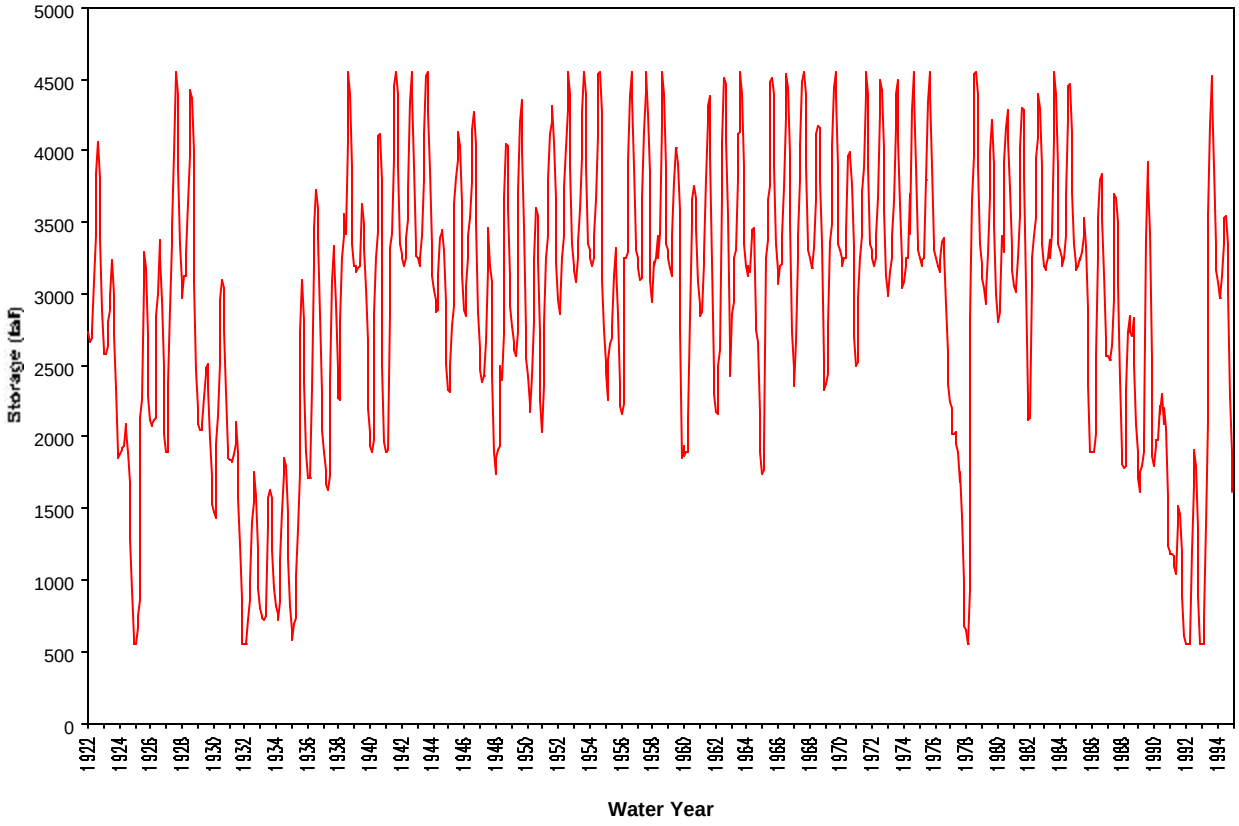

Figure V.5.1 shows Shasta Lake storage. There are 19 years in which the Shasta Lake carryover storage is lower than 1.9 maf. In 11 of those years, the carryover storage is between 1,000 and 1,900 taf, and in 8 of those years, the carryover storage is between 550 and 1000 taf. Most of the low carryover storage occurs in dry years including 1924, the 1928 through 1934 dry period, 1977, and the 1986 through 1992 dry period. In those dry years, Shasta reservoir is operated mostly to meet AFRP or temperature control flows at Keswick Dam or navigational control flow requirements. The CVP Settlement Contractors (full allocation 2.2 maf/year, are assumed to use their entire yearly allocation, whether full or 25% deficiency. This is a conservative approach that aggravates the low Shasta carryover problem in this simulation. Also, it is certain that NMFS and Reclamation would develop extraordinary measures to avoid carryover as low as is shown here in the dry years, but it is not possible to simulate this adaptive management with this version of CALSIM.

Table V.5.1
Shasta Lake Release Control

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Carryover Storage, taf
1922	NCP	Other	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	NCP	2610
1923	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	NCP	NCP	1667
1924	NCP	Keswick	Keswick	Keswick	Keswick	Other	NCP	NCP	Other	NCP	Other	NCP	550
1925	Keswick	Keswick	Keswick	Keswick	Keswick	Other	Keswick	NCP	NCP	Other	NCP	Keswick	2120
1926	NCP	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	Other	NCP	1900
1927	NCP	Keswick	Keswick	Keswick	Other	Keswick	Other	Other	NCP	NCP	Other	NCP	3089
1928	Keswick	Keswick	Keswick	Keswick	Keswick	Other	Keswick	Keswick	NCP	Other	Other	Other	2206
1929	NCP	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	Other	NCP	NCP	1539
1930	NCP	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	NCP	1856
1931	NCP	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	NCP	NCP	Keswick	550
1932	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	NCP	NCP	Other	808
1933	NCP	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	Other	NCP	NCP	813
1934	NCP	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	Other	NCP	Other	Other	648
1935	Other	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	Other	Other	NCP	1719
1936	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	Other	2061
1937	NCP	Other	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	NCP	NCP	2278
1938	Keswick	Keswick	Other	Other	Other	Other	Other	Keswick	Other	Other	Other	NCP	3191
1939	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	NCP	Other	Keswick	2034
1940	Other	Other	Keswick	Keswick	Other	Other	Keswick	Keswick	NCP	Other	Other	NCP	1900
1941	NCP	NCP	Keswick	Other	Other	Other	Other	Other	Other	Other	Other	NCP	3273
1942	Other	Keswick	Other	Other	Other	Keswick	Keswick	Keswick	Other	Other	Other	NCP	3261
1943	Other	Other	Other	Other	Other	Other	Keswick	Keswick	NCP	NCP	Other	NCP	3119
1944	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	Keswick	NCP	NCP	NCP	NCP	2326
1945	NCP	Keswick	Keswick	Keswick	Keswick	Other	Keswick	Keswick	NCP	NCP	NCP	NCP	2987
1946	Other	Keswick	Other	Other	Keswick	Keswick	NCP	NCP	NCP	Other	Other	Other	2617
1947	Other	Other	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	Other	Other	Other	NCP	1741
1948	Keswick	Keswick	Keswick	Keswick	Other	Keswick	Keswick	Keswick	Keswick	Other	Other	Other	2918
1949	Other	Other	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	Other	Other	NCP	2555
1950	Other	Other	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	NCP	NCP	2038
1951	NCP	Keswick	Other	Other	Other	Keswick	NCP	Keswick	NCP	NCP	NCP	Other	2963
1952	Other	Other	Other	Other	Other	Other	Other	Other	Keswick	Other	Other	Keswick	3200
1953	Keswick	Keswick	Other	Other	Keswick	Keswick	Keswick	Keswick	Other	Other	Other	Other	3300
1954	Other	Other	Other	Other	Other	Other	Other	Other	NCP	Other	Other	Other	2519
1955	Other	Other	Keswick	Keswick	Other	Keswick	Keswick	Keswick	NCP	Other	Other	Keswick	2218
1956	Other	Keswick	Other	Other	Other	Keswick	Keswick	Other	Keswick	Other	Other	Other	3300
1957	Other	Keswick	Keswick	Keswick	Other	Other	Keswick	Other	NCP	NCP	Other	Other	2950
1958	Keswick	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	3300
1959	Other	Keswick	Keswick	Other	Other	Other	NCP	NCP	NCP	Other	Other	Other	1941
1960	Other	Keswick	Other	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	Other	Keswick	2925
1961	Keswick	Keswick	Keswick	Keswick	Other	Keswick	Other	Other	Other	Other	Other	Other	2297
1962	Other	Other	Keswick	Keswick	Other	Keswick	NCP	NCP	NCP	NCP	Other	Other	2419
1963	Keswick	Keswick	Other	Keswick	Other	Keswick	Other	Keswick	NCP	Other	Other	Keswick	3189
1964	Keswick	Other	Keswick	Other	Keswick	Keswick	Other	NCP	NCP	Other	Other	Keswick	1747
1965	NCP	Keswick	Other	Other	Keswick	Keswick	Keswick	Keswick	NCP	Other	Other	NCP	3167
1966	Keswick	Other	Keswick	Other	Keswick	Other	Other	NCP	NCP	Other	Other	Other	2483
1967	Other	Keswick	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	3300
1968	Other	Keswick	Keswick	Keswick	Other	Keswick	NCP	Keswick	NCP	Other	Other	NCP	2330
1969	Keswick	Keswick	Keswick	Other	Other	Other	Other	Other	NCP	Other	Other	Other	3300
1970	Other	Keswick	Other	Other	Other	Keswick	NCP	NCP	NCP	Other	Other	NCP	2501
1971	Keswick	Keswick	Other	Other	Keswick	Other	Keswick	Other	Other	Other	Other	Other	3300
1972	Other	Other	Other	Other	Keswick	Other	NCP	NCP	NCP	NCP	Other	Keswick	2994
1973	Keswick	Keswick	Other	Other	Other	Other	Keswick	Keswick	NCP	NCP	Other	Other	3046
1974	Other	Other	Other	Other	Other	Other	Other	Keswick	NCP	Other	Other	Other	3300
1975	Other	Other	Keswick	Keswick	Other	Other	Keswick	Other	NCP	Other	Other	Other	3300
1976	Other	Other	Keswick	Keswick	Keswick	Keswick	Other	Other	Other	Other	Keswick	Keswick	2249
1977	Other	Other	NCP	Keswick	Other	Keswick	Other	NCP	Other	Other	Other	Other	649
1978	Other	Keswick	Keswick	Keswick	Other	Other	Other	Other	NCP	Other	Other	Keswick	3212
1979	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	Other	Keswick	2813
1980	Keswick	Keswick	Keswick	Other	Other	Keswick	Keswick	Keswick	NCP	NCP	NCP	Keswick	3168
1991	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	Other	Other	Keswick	2112
1992	Other	Keswick	Other	Other	Other	Other	Other	Keswick	Keswick	Keswick	Other	Keswick	3196
1993	Keswick	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	3300
1994	Other	Other	Other	Other	Keswick	Keswick	Keswick	NCP	NCP	NCP	Other	Keswick	3212
1995	Keswick	Other	Other	Keswick	Keswick	Keswick	Keswick	NCP	Other	Other	Other	Other	1900
1996	Other	Other	Keswick	Keswick	Other	Other	Keswick	NCP	NCP	NCP	NCP	Keswick	2560
1997	NCP	NCP	Keswick	Keswick	Keswick	Keswick	NCP	NCP	Other	Other	Other	NCP	1607
1998	Other	Keswick	Keswick	Keswick	Other	Other	NCP	Keswick	Other	Other	NCP	Other	1710
1999	Other	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	Other	Other	Other	Keswick	1793
2000	Other	Other	Keswick	Keswick	Other	Keswick	NCP	Keswick	NCP	Other	NCP	NCP	1199
2001	NCP	Keswick	Keswick	Other	Other	Keswick	Keswick	NCP	NCP	NCP	NCP	Other	550
2002	NCP	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	Other	Other	Other	Keswick	550
2003	NCP	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	Other	Other	Other	Keswick	3172
2004	Keswick	Keswick	Keswick	Keswick	Keswick	Keswick	NCP	NCP	NCP	Other	Other	Other	1614

Table V.5.1 shows the factors controlling Shasta releases. In the 1928 to1934 dry period, there are 41 months when Keswick (AFRP or temperature flows), 33 months when NCP (Navigational Control Point) controls, and 10 months when Other (Delta requirements, flood control release, Delta exports or Sacramento River diversions) controls.

Figure V.5.2
Sacramento River Flow Below Keswick Dam

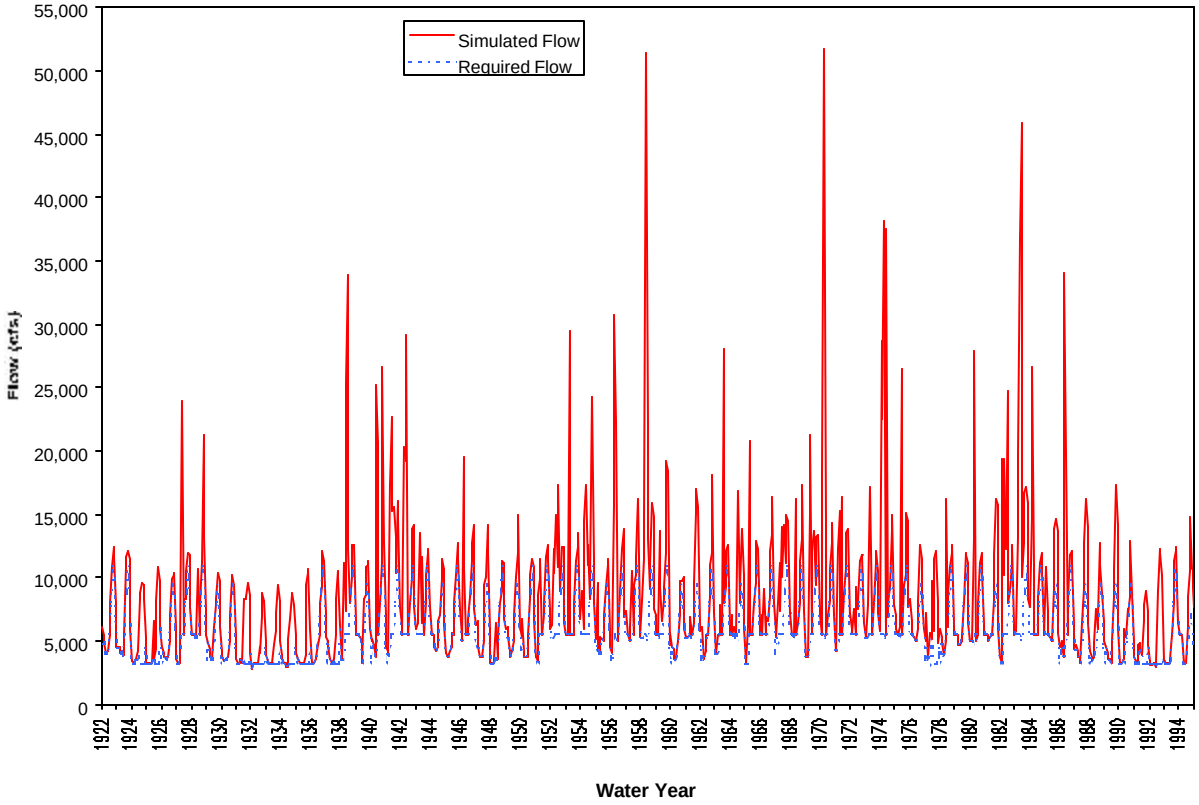

Figure V.5.2 shows the simulated and minimum instream required flows in the Sacramento River below Keswick Dam. The minimum required flows (AFRP and temperature control flows) tend to control the releases from Keswick Dam in the dry years.

V.6. American River

Figure V.6.1
Folsom Lake Storage

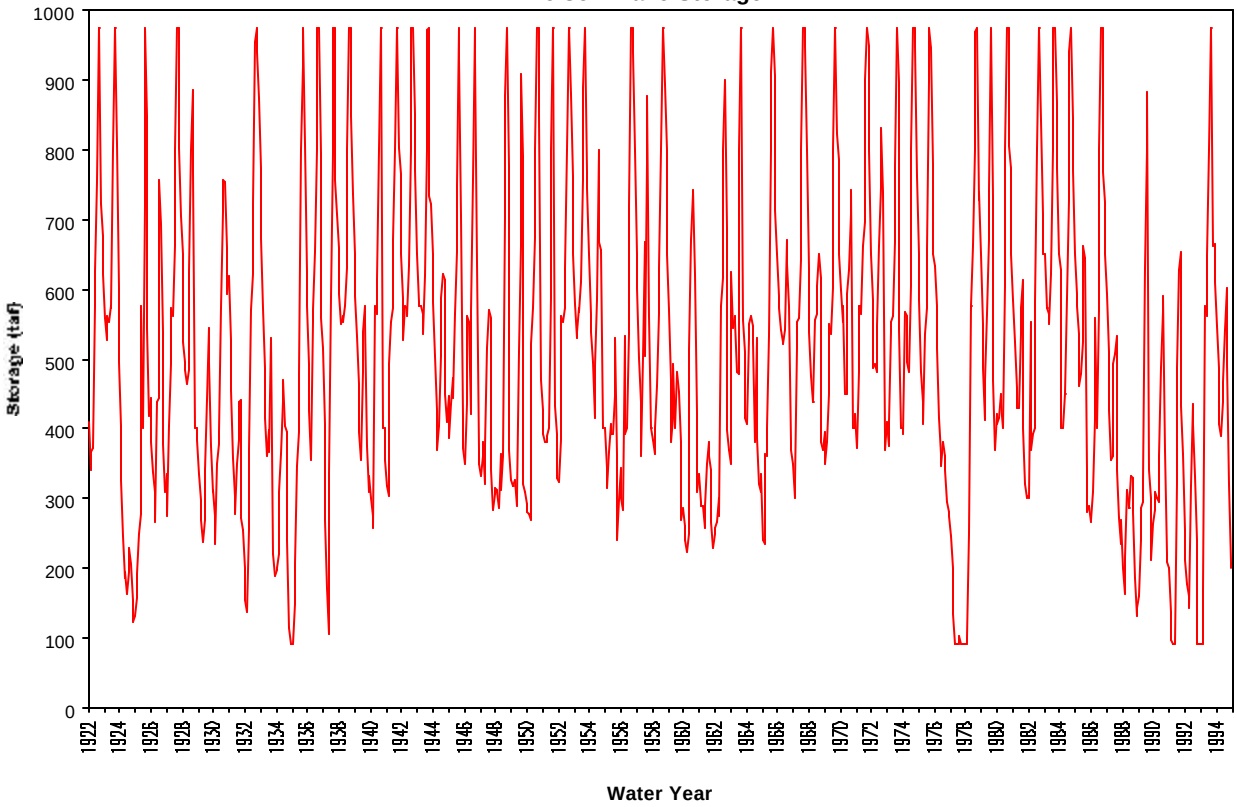

Figure V.6.1 shows Folsom Lake storage. In most months in dry years, Folsom Lake release is controlled by the AFRP flows at Nimbus.

Table V.6.1
Folsom Lake Release Control

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Carryover Storage, taf
1922	Other	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Other	Other	Other	Other	Nimbus	623
1923	Nimbus	Nimbus	Other	Other	Other	Nimbus	Other	Other	Other	Other	Other	Other	495
1924	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	H Street	H Street	Nimbus	Other	Other	Nimbus	131
1925	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Other	Other	Other	Other	Nimbus	445
1926	Other	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Nimbus	334
1927	Other	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	Other	650
1928	Other	Other	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	385
1929	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	311
1930	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	620
1931	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Other	Nimbus	Other	199
1932	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	775
1933	Other	Other	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Other	Other	Other	196
1934	Other	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Nimbus	Other	90
1935	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Other	Nimbus	578
1936	Other	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	Nimbus	517
1937	Other	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Nimbus	659
1938	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	650
1939	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Nimbus	Other	Other	Nimbus	331
1940	Other	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	Other	396
1941	Other	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Nimbus	Other	650
1942	Nimbus	Other	Other	Other	Other	Nimbus	Other	Other	Other	Other	Other	Other	650
1943	Nimbus	Other	Other	Other	Other	Other	Other	Nimbus	Other	Other	Other	Other	650
1944	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Nimbus	448
1945	Other	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Nimbus	Other	Other	Other	Nimbus	371
1946	Other	Nimbus	Other	Other	Other	Nimbus	Nimbus	Other	Other	Other	Other	Other	350
1947	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Nimbus	Nimbus	315
1948	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Nimbus	325
1949	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	292
1950	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Nimbus	427
1951	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Nimbus	Nimbus	328
1952	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	650
1953	Other	Nimbus	Nimbus	Other	Other	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Other	650
1954	Other	Nimbus	Nimbus	Other	Nimbus	Other	Other	Other	Nimbus	Other	Other	Other	400
1955	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Other	Other	Nimbus	343
1956	Other	Nimbus	Other	Other	Other	Nimbus	Nimbus	Other	Other	Other	Other	Other	650
1957	Nimbus	Other	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Nimbus	Other	Other	Other	400
1958	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	650
1959	Other	Other	Nimbus	Nimbus	Nimbus	Other	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	287
1960	Other	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Other	Other	Other	Nimbus	335
1961	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Nimbus	Nimbus	Nimbus	248
1962	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Nimbus	Other	Other	Other	Other	350
1963	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	415
1964	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Other	Other	Nimbus	335
1965	Other	Nimbus	Other	Other	Other	Nimbus	Other	Other	Other	Other	Other	Other	650
1966	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	350
1967	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	Other	631
1968	Other	Other	Nimbus	Nimbus	Other	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	395
1969	Other	Nimbus	Nimbus	Other	Other	Nimbus	Other	Other	Other	Other	Nimbus	Other	650
1970	Nimbus	Nimbus	Other	Other	Other	Other	Other	Nimbus	Nimbus	Other	Other	Nimbus	422
1971	Nimbus	Nimbus	Other	Other	Other	Other	Other	Nimbus	Other	Other	Other	Other	650
1972	Nimbus	Other	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Other	Other	Other	Nimbus	409
1973	Nimbus	Nimbus	Nimbus	Other	Other	Other	Nimbus	Other	Other	Other	Other	Other	400
1974	Nimbus	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	650
1975	Nimbus	Other	Nimbus	Nimbus	Nimbus	Other	Nimbus	Nimbus	Other	Other	Other	Other	650
1976	Nimbus	Other	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Other	Nimbus	Nimbus	276
1977	Nimbus	Nimbus	Nimbus	Nimbus	H Street	H Street	H Street	H Street	Nimbus	Nimbus	Nimbus	H Street	90
1978	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Nimbus	Other	Other	Nimbus	Other	650
1979	Other	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Other	Other	Other	Nimbus	420
1980	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Nimbus	Other	650
1981	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Nimbus	Nimbus	305
1982	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	650
1983	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	650
1984	Other	Other	Other	Other	Other	Other	Other	Nimbus	Other	Other	Other	Other	650
1985	Nimbus	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Other	267
1986	Nimbus	Other	Nimbus	Other	Other	Other	Other	Other	Other	Other	Nimbus	Other	650
1987	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Other	Nimbus	Nimbus	270
1988	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	144
1989	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Nimbus	Other	Nimbus	264
1990	Other	Other	Nimbus	Nimbus	Nimbus	Nimbus	Other	Nimbus	Other	Other	Other	Other	200
1991	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Nimbus	256
1992	Other	Other	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	Nimbus	H Street	90
1993	Other	Nimbus	Nimbus	Other	Other	Other	Other	Other	Other	Other	Nimbus	Nimbus	612
1994	Other	Other	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Other	Other	Other	Other	200

Table V.6.1 shows the factors controlling Folsom Lake release. In the 1928 to1934 dry period, there are 47 months when Nimbus minimum required flow controls and 37 months when other (American River diversions, Delta required flows, Delta exports, or flood control releases) controls.

Figure V.6.2
American River Flow at Nimbus Dam

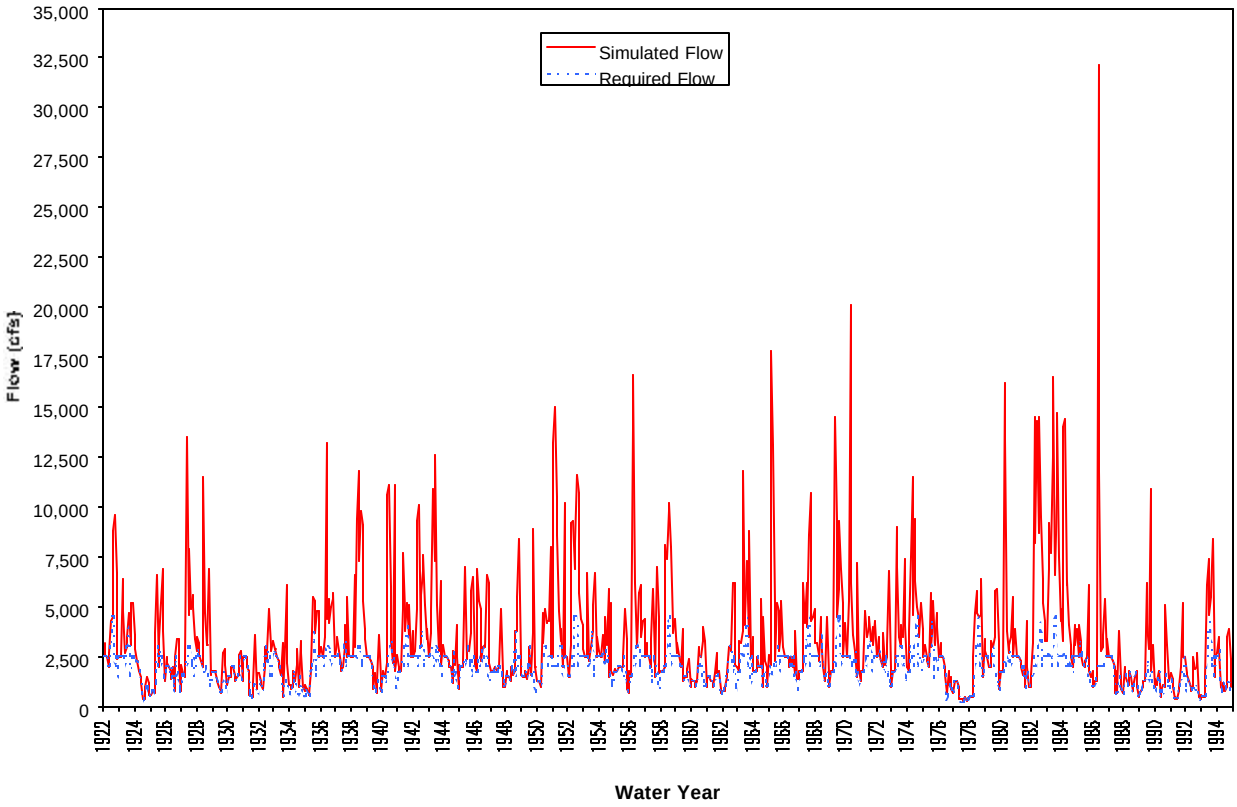

Figure V.6.2 shows the simulated and minimum instream required flows in the American River below Nimbus Dam. The minimum instream flows at Nimbus tend to control Folsom reservoir operations in some months of most years.

Figure V.6.3
American River Flow at H St

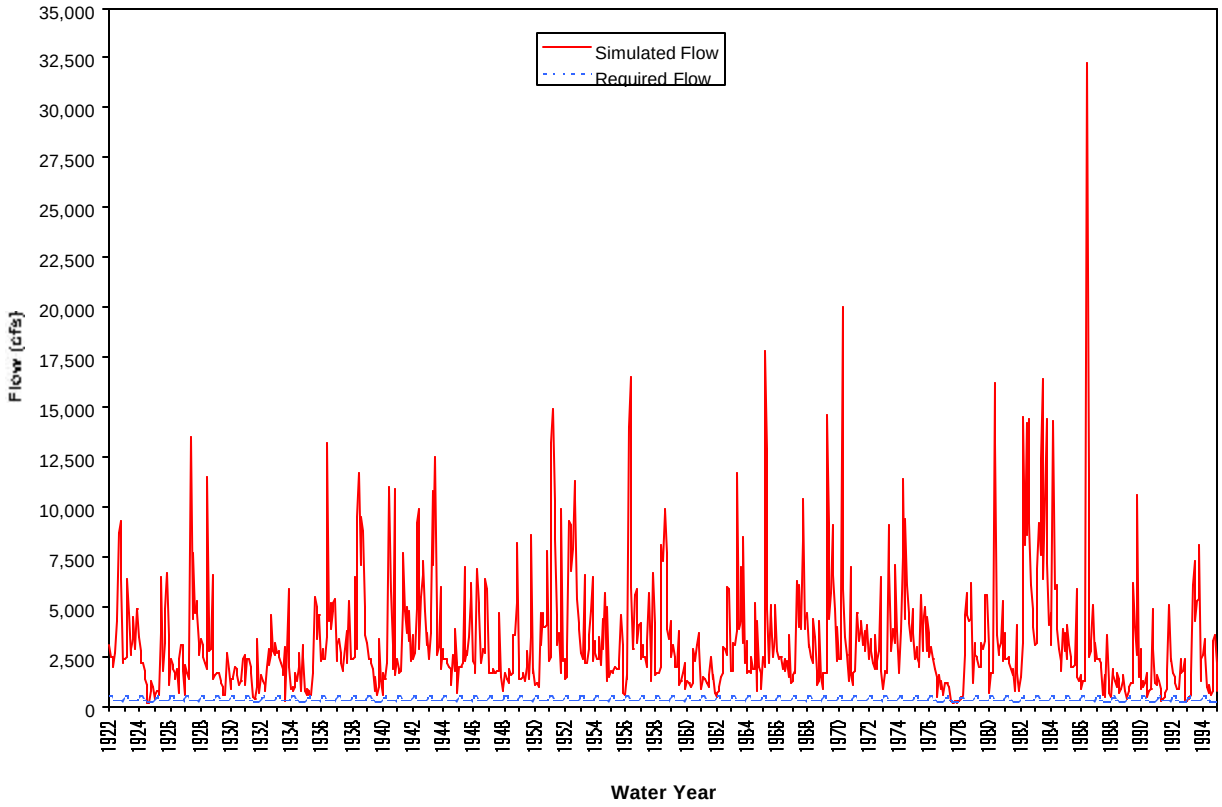

Figure V.6.3 shows the simulated and minimum instream required flows in the American River at H Street. The minimum instream flows at Nimbus tend to control Folsom reservoir operations in some months of most years.

V.7. Feather River

Figure V.7.1
Lake Oroville Storage

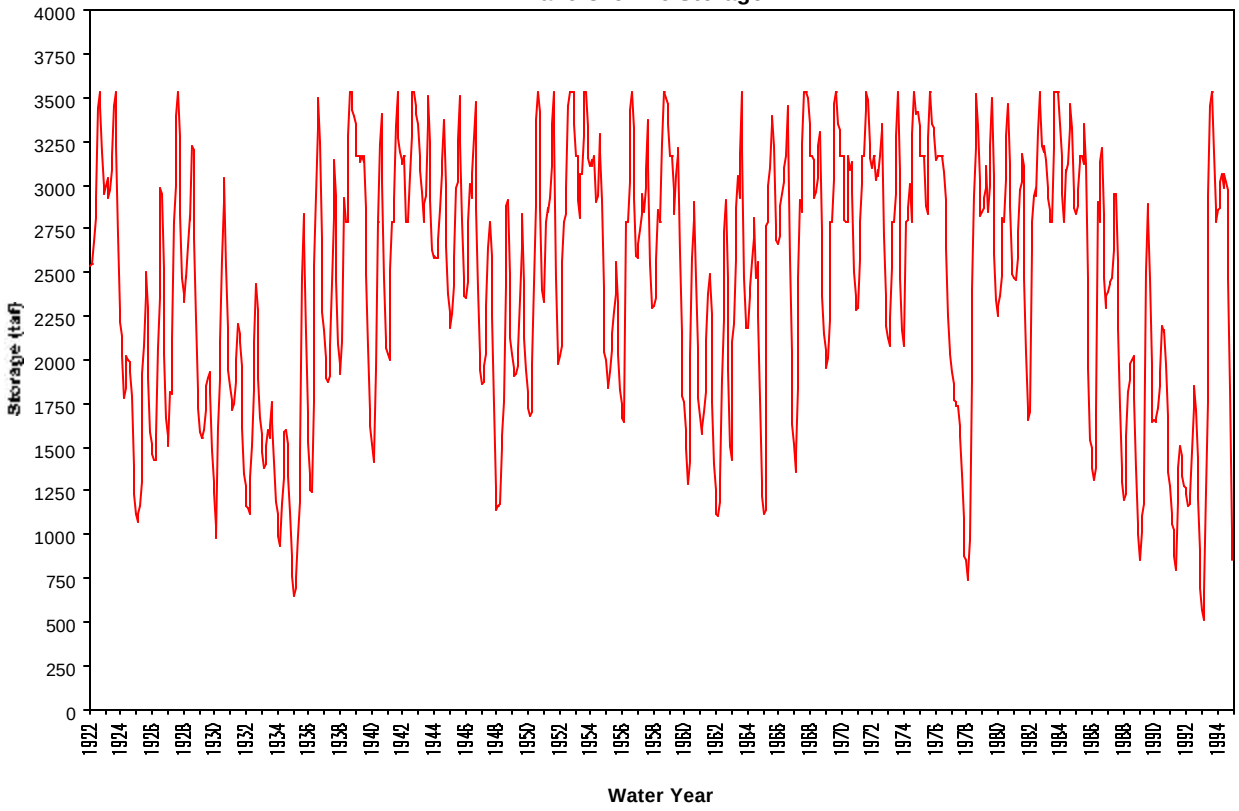

Figure V.7.1 shows Lake Oroville storage. The lowest storage value is 505 taf.

Figure V.7.2
Feather River Flow Below Thermalito

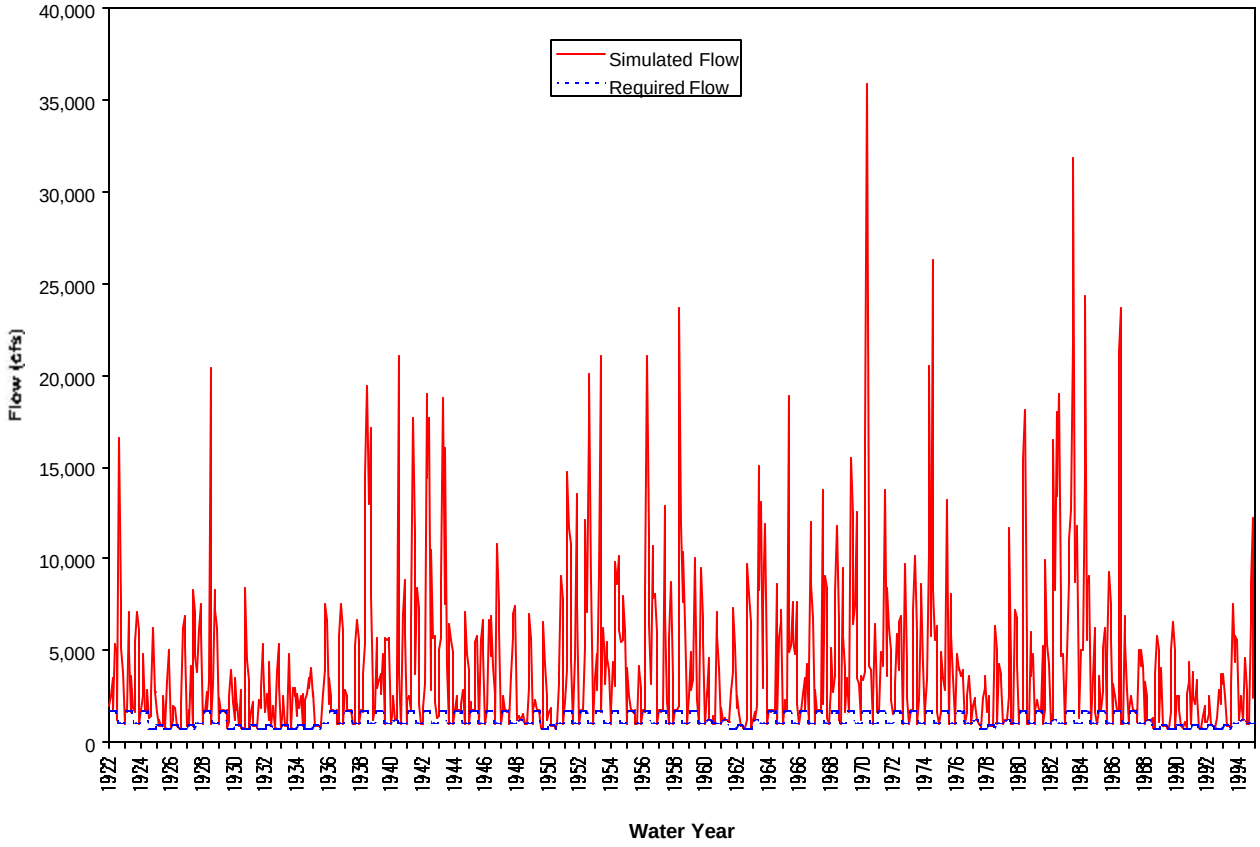

Figure V.7.2 shows simulated and minimum instream required flows in the Feather River below Thermalito Diversion Dam. The simulated flows are almost always higher than the minimum required flows. The river's minimum instream flow does not control Oroville reservoir operations in most years.

V.8. Stanislaus/San Joaquin Rivers

Figure V.8.1
New Melones Reservoir Storage

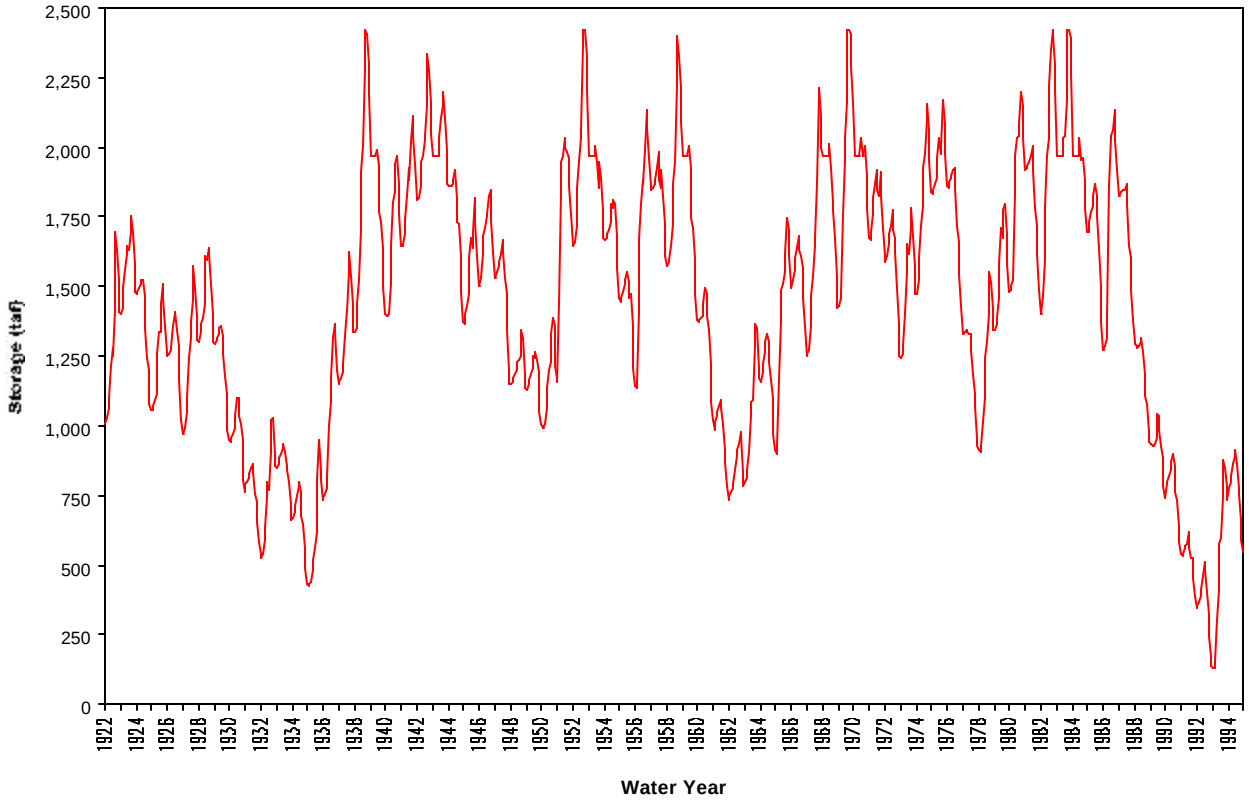

Figure V.8.1 shows New Melones Reservoir storage.

Figure V.8.2
Stanislaus River Flow Below Goodwin Dam

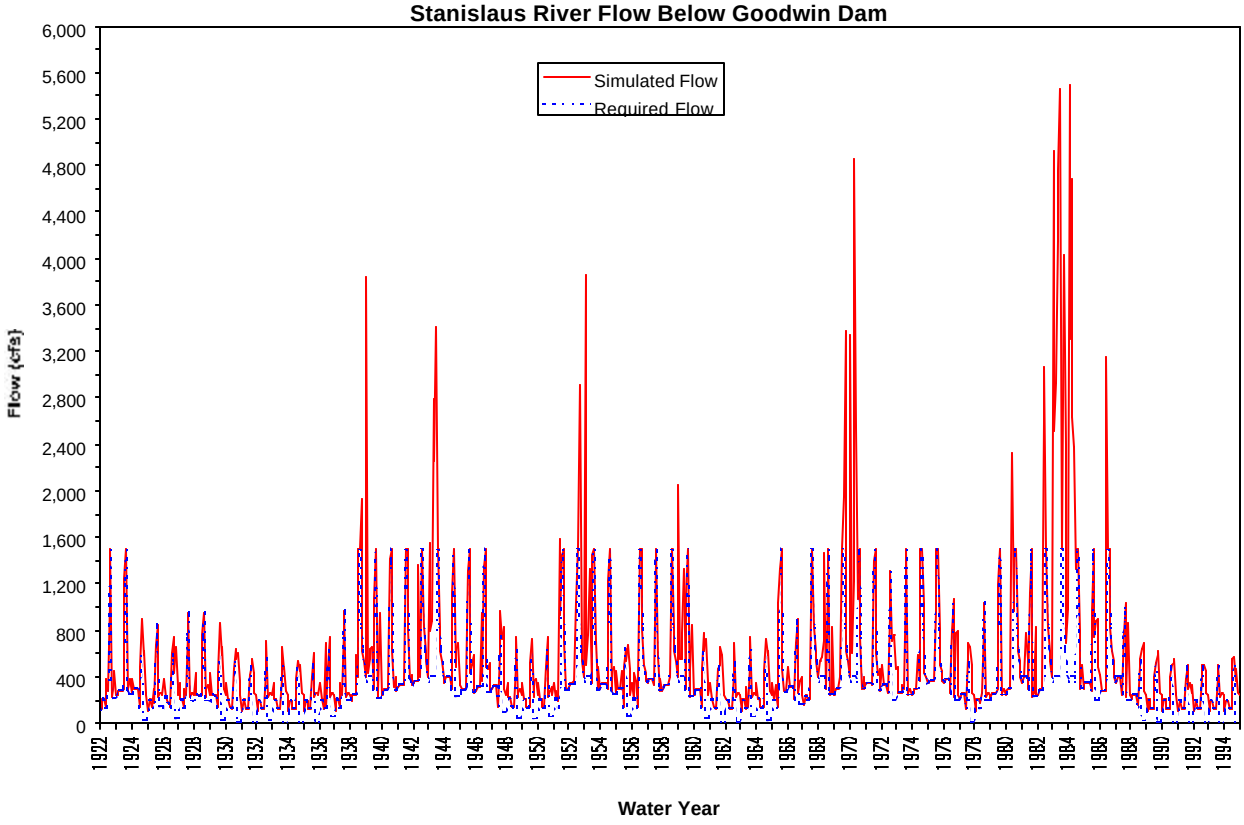

Figure V.8.2 shows the simulated and minimum instream required flows in the Stanislaus River at Goodwin. The minimum instream flows tend to control New Melones releases at Goodwin Dam in some months of most years.

Figure V.8.3
San Joaquin River simulated flow at Vernalis

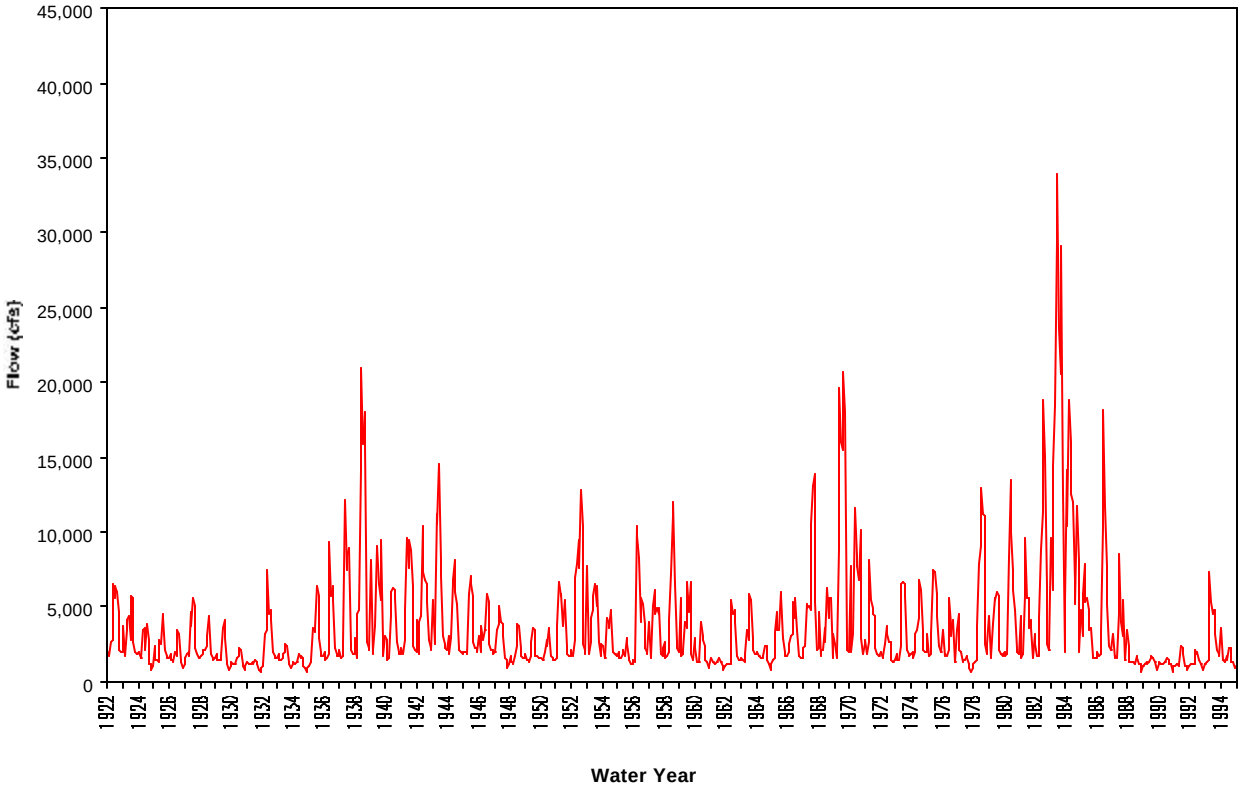

Figure V.8.3 shows the simulated San Joaquin River flow at Vernalis.

V.9. Delta

Figure V.9.1
Total Required Delta Outflow

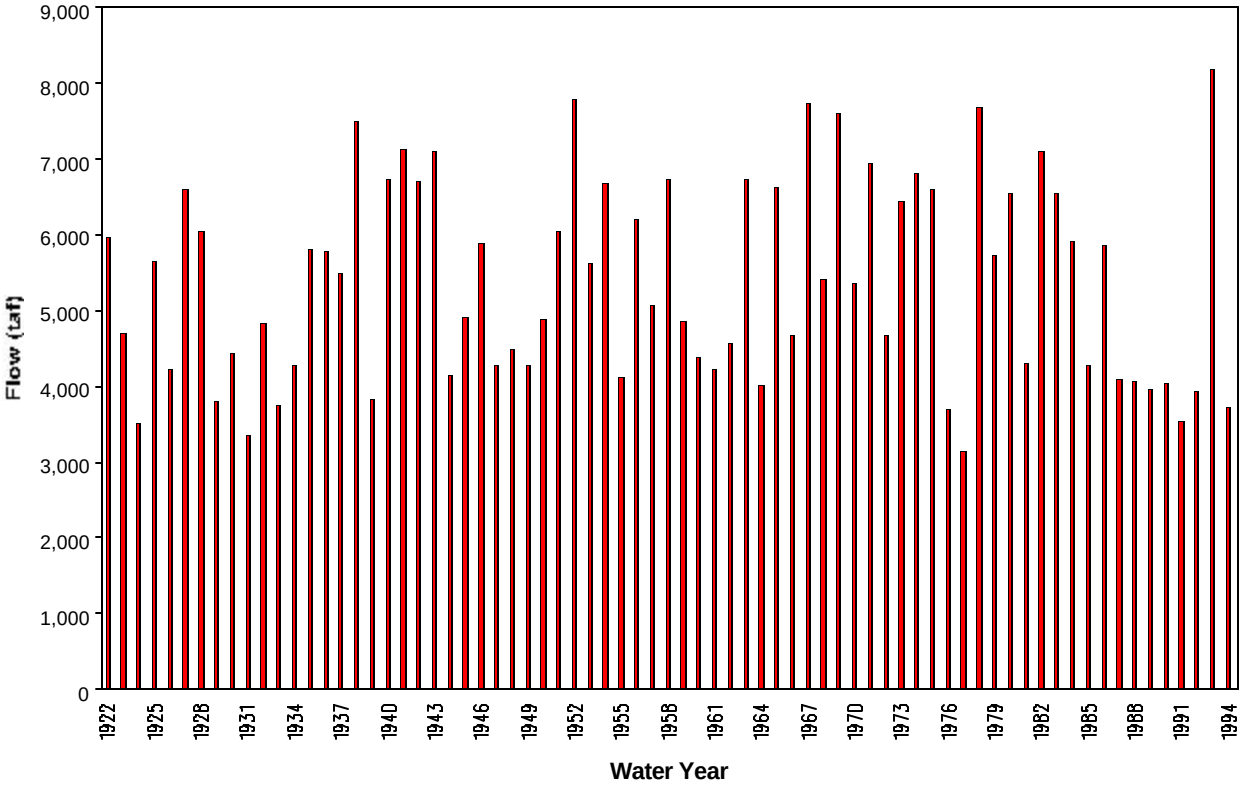

Figure V.9.1 shows the total annual required Delta outflow. The total required outflow is the flow needed to meet x2 and minimum outflow requirements. The average annual total required Delta outflow is 5,380 taf.

Figure V.9.2
Total Delta Outflow

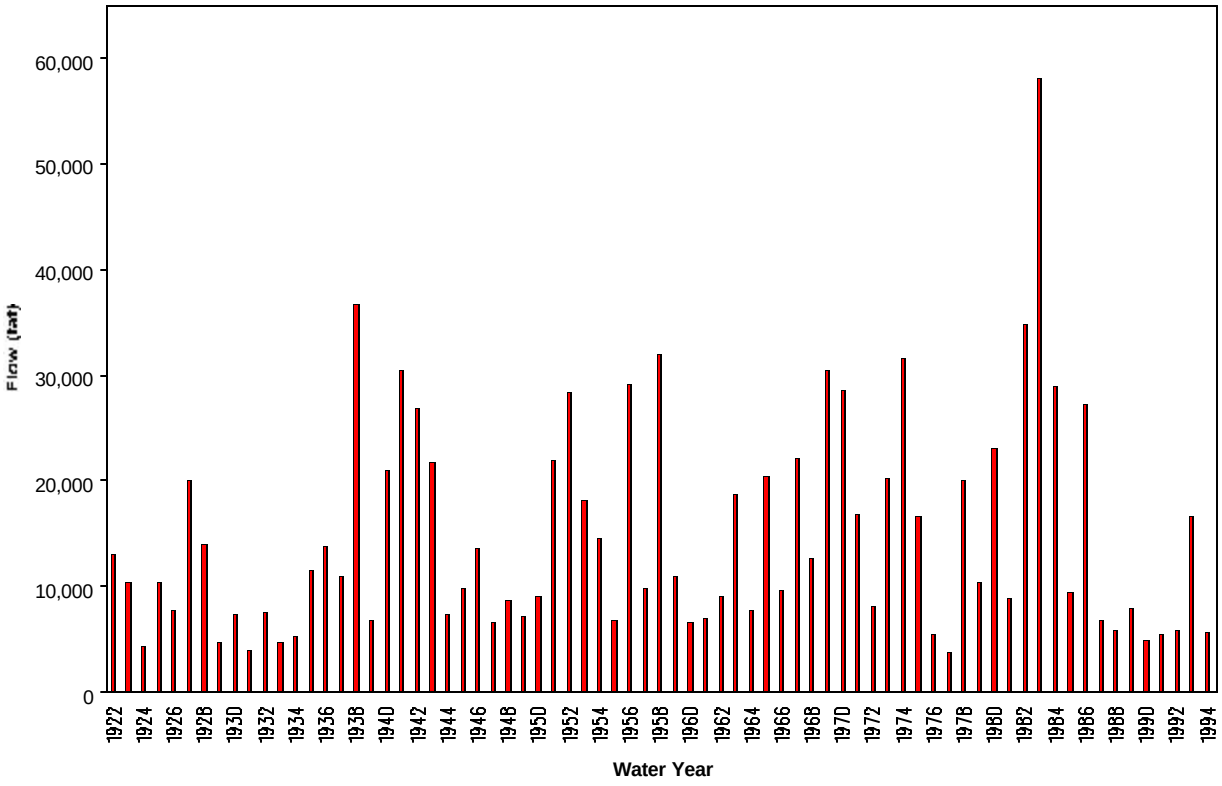

Figure V.9.2 shows annual total Delta outflow. The average annual total Delta outflow is 14,850 taf.

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Figure V.9.3
Minimum Required Flow at Sacramento River at Freeport for ANN Requirements

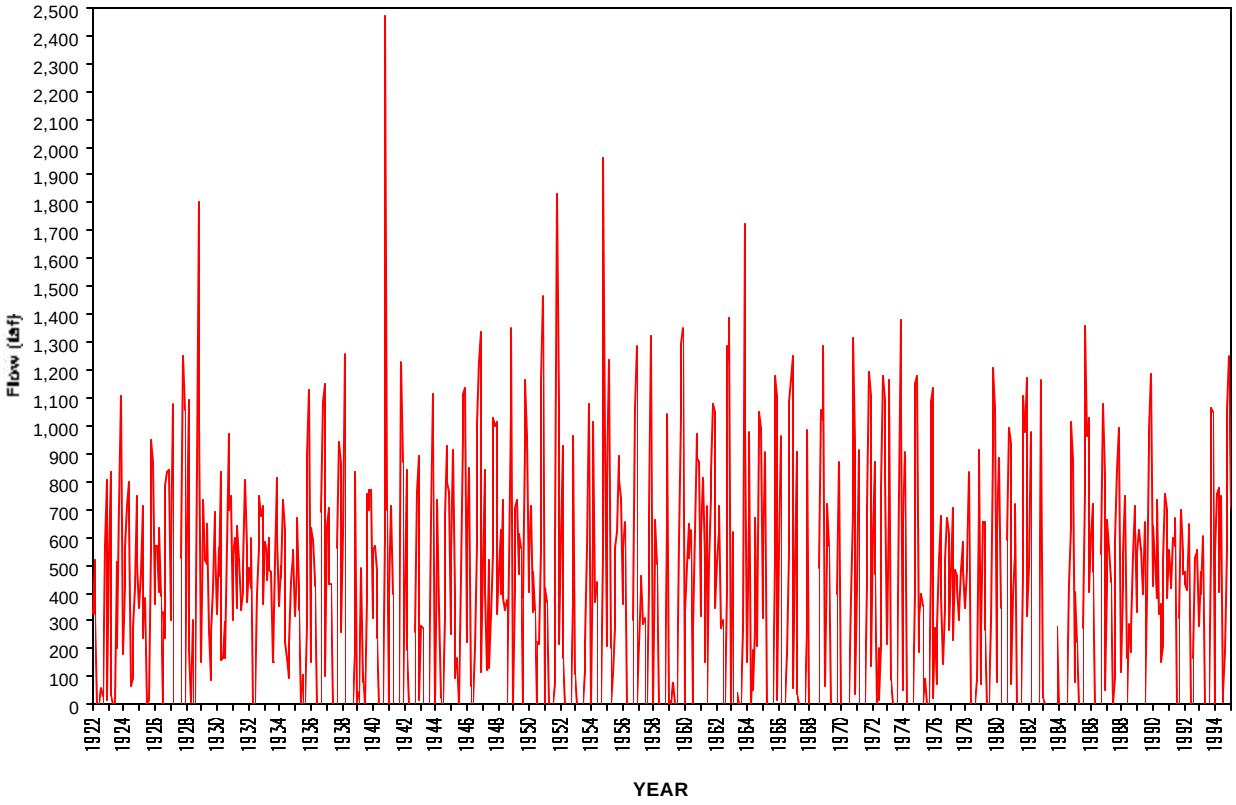

Figure V.9.3 shows the total required flow at Sacramento River at Freeport for Artificial Neural Network salinity requirements.

Figure V.9.4
X2 Position

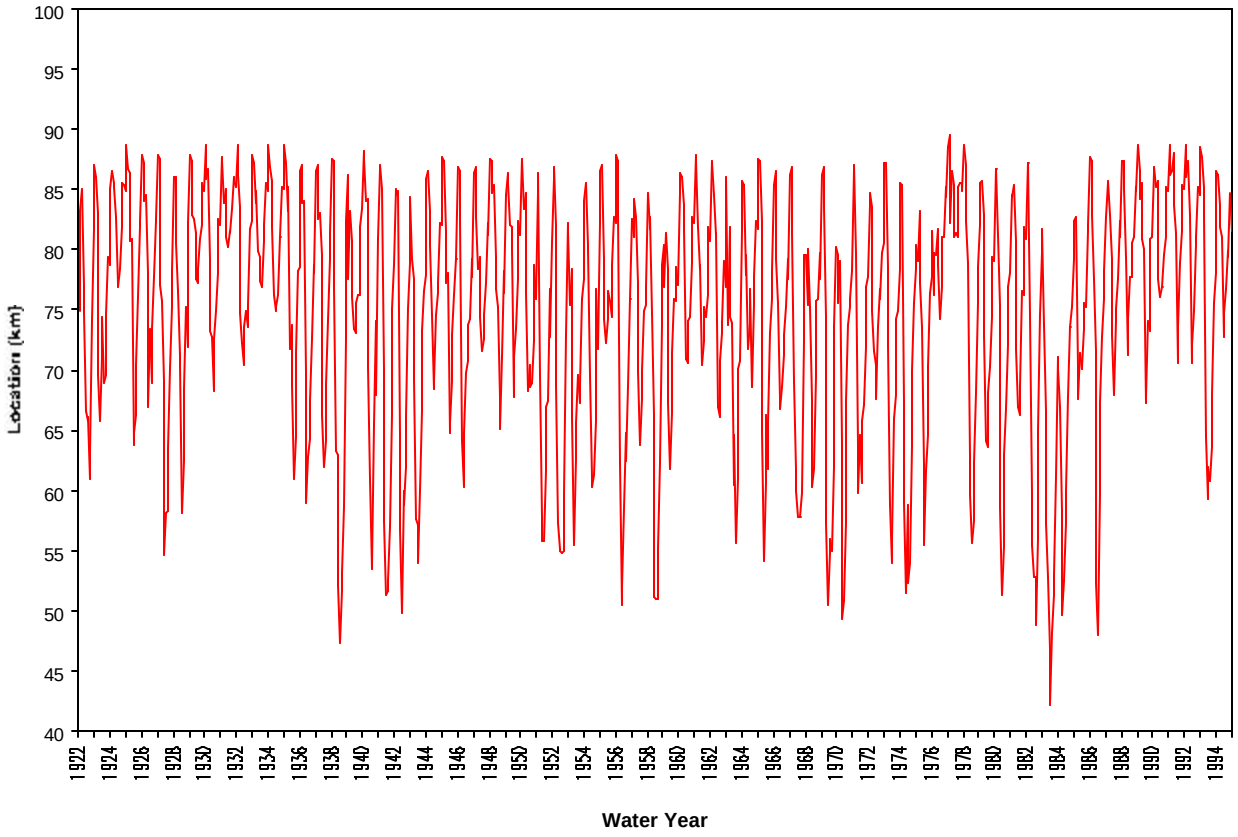

Figure V.9.4 shows the monthly resulting X2 position. The X2 position ranges from 42 km to 90 km.

Figure V.9.5
Average Monthly QWEST Flows

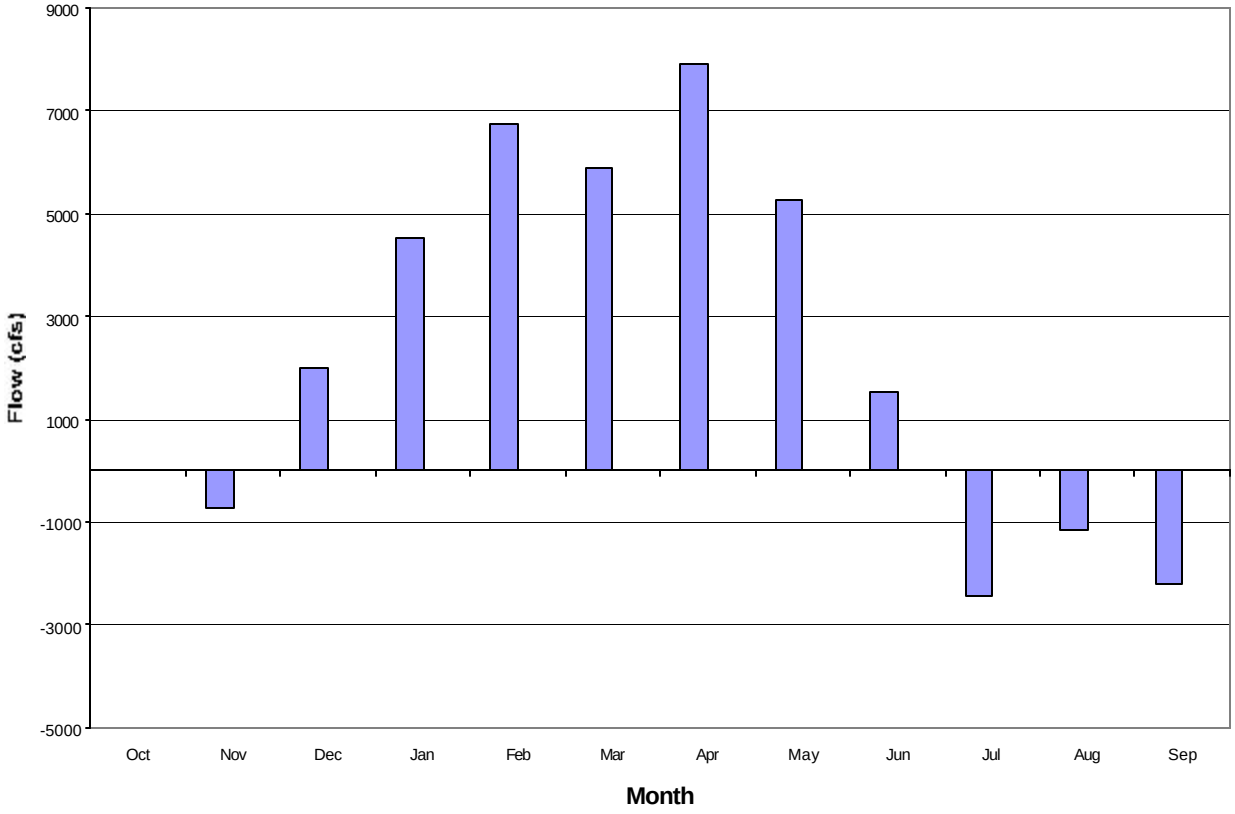

Figure V.9.5 shows the average monthly QWEST flows. The average QWEST flows are negative in November, July, August, and September.

V.10. South-of-Delta

Figure V.10.1
SWP San Luis Reservoir Storage

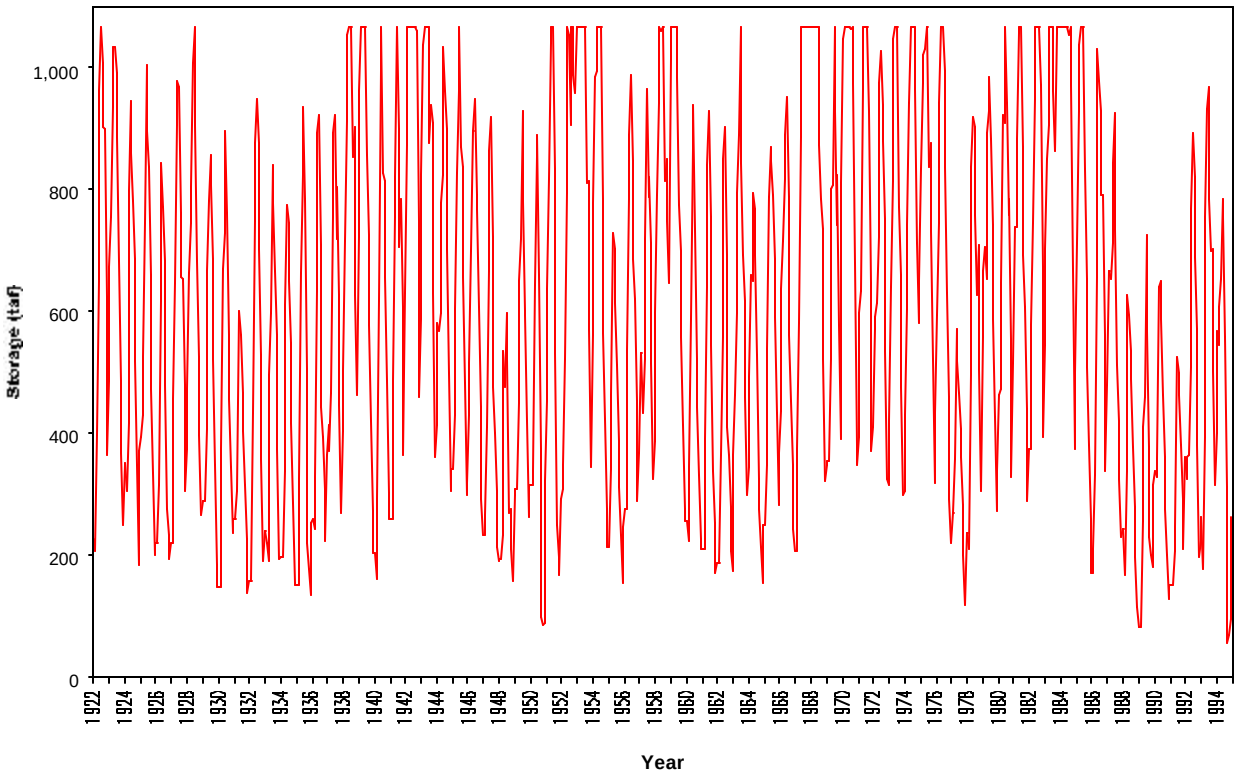

Figure V.10.1 shows SWP San Luis reservoir storage. The low points shown do not include EWA's storage debt owed to the SWP. The September end-of-month storage in SWP San Luis includes EWA debt payback.

Figure V.10.2
CVP San Luis Reservoir Storage

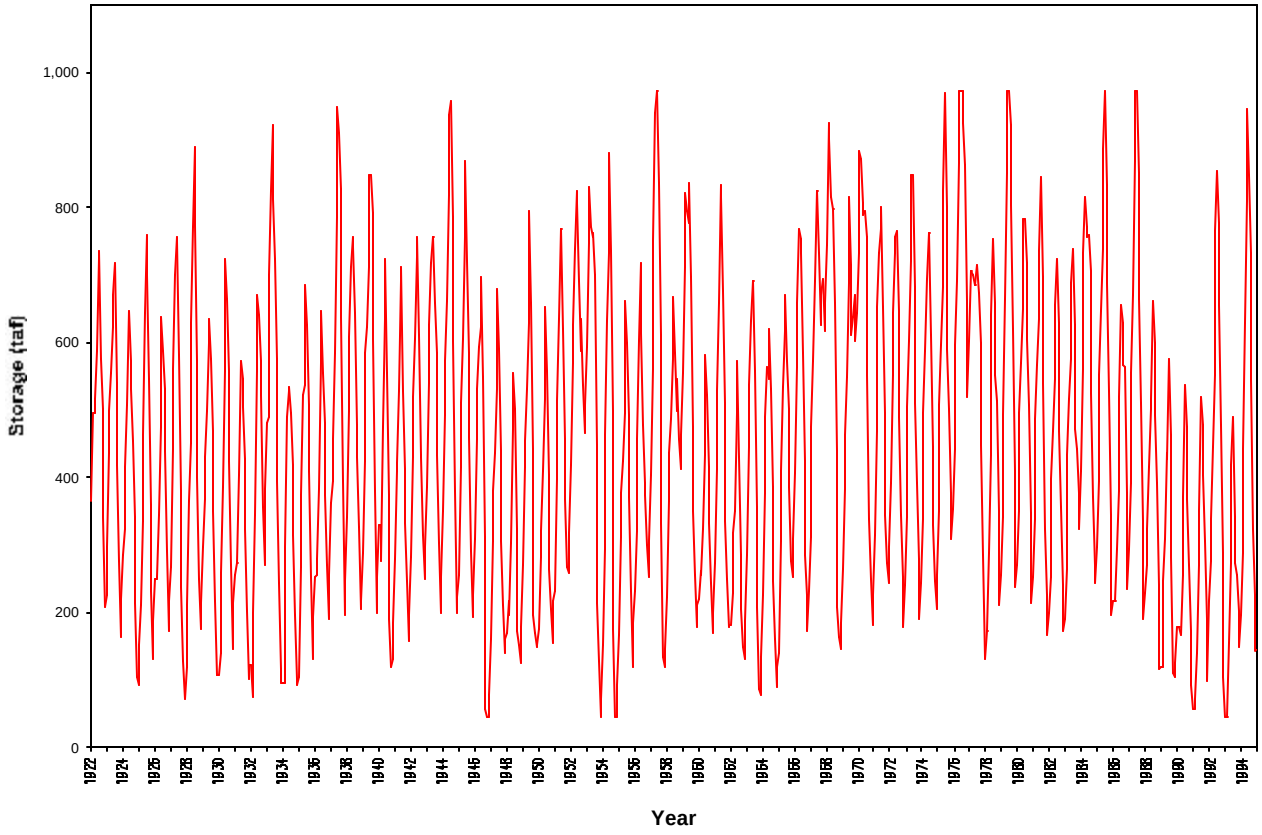

Figure V.10.2 shows CVP San Luis reservoir storage. The low points shown do not include EWA's storage debt owed to the projects. The September end-of-month storage in CVP San Luis Reservoir includes EWA debt payback .

V.11. CVPIA (b)(2) Accounting Metrics Computations

This section shows the computations of the storage, release and export metrics developed by the Department of the Interior for accounting the (b)(2) cost. The computations included in this report are for water years 1922 through 1926 for the sample study. The computations for the entire 73-year study period are available but are too massive to include in this report.

Table V.11.1 shows the storage, releases, and exports from the D1485 study. The D1485 study is the baseline from which the CVP WQCP cost in the WQCP study is measured. Trinity, Shasta, Folsom, and New Melones Lake storages are shown in columns B through E, and the total storage of all the reservoirs is shown in column F. The releases below Goodwin Dam, Whiskeytown Lake, Keswick Reservoir, and Lake Natoma (Nimbus) are shown in columns G – J, and the total of all the releases is shown in column K. The CVP exports at Tracy Pumping Plant and CVP wheeling are shown in columns L and M, and the total CVP exports are shown in column N.

Table V.11.2 shows the storage, releases, and exports from the WQCP study. The WQCP study is used to compute the CVP WQCP cost as measured from the D1485 study. It is also the baseline from which the (b)(2) cost is measured against in the (b)(2) study. Trinity, Shasta, Folsom, and New Melones Lake storages are shown in columns B through E, and the total storage of all the reservoirs is shown in column F. The releases below Goodwin Dam, Whiskeytown Lake, Keswick Reservoir, and Lake Natoma (Nimbus) are shown in columns G – J, and the total of all the releases is shown in column K. The CVP exports at Tracy Pumping Plant and CVP wheeling are shown in columns L and M, and the total CVP exports are shown in column N.

Table V.11.3 shows the storage, releases, and exports from the (b)(2) study. The (b)(2) study is used to compute the cost of (b)(2) actions as measured against the WQCP study. Trinity, Shasta, Folsom, and New Melones Lake storages are shown in columns B through E, and the total storage of all the reservoirs is shown in column F. The releases below Goodwin Dam, Whiskeytown Lake, Keswick Reservoir, and Lake Natoma (Nimbus) are shown in columns G – J, and the total of all the releases is shown in column K. The CVP exports at Tracy Pumping Plant and CVP wheeling are shown in columns L and M, and the total CVP exports are shown in column N.

Table V.11.1
D1485 Results

A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Storage (TAF)					Releases (TAF)					Exports (TAF)		
Date	Trinity	Shasta	Folsom	New Melones	**Total**	Goodwin	Whiskeytown	Keswick	Natoma	**Total**	Tracy	CVP Banks	**Total**
Oct-21	1,850	2,737	470	1,004	**6,061**	7	3	383	132	**525**	270	40	**310**
Nov-21	1,837	2,727	443	1,025	**6,031**	12	6	259	108	**385**	223	40	**263**
Dec-21	1,839	2,867	543	1,063	**6,312**	12	6	200	80	**298**	260	0	**260**
Jan-22	1,836	2,981	553	1,103	**6,472**	8	3	200	117	**328**	260	0	**260**
Feb-22	1,850	3,358	575	1,211	**6,994**	22	3	180	328	**533**	236	0	**236**
Mar-22	1,890	3,758	631	1,287	**7,566**	8	3	200	253	**464**	266	0	**266**
Apr-22	1,979	4,195	800	1,297	**8,272**	15	3	327	228	**573**	240	0	**240**
May-22	1,935	4,435	975	1,529	**8,873**	31	3	492	589	**1,115**	184	0	**184**
Jun-22	1,989	4,087	975	1,816	**8,867**	13	3	655	572	**1,243**	178	0	**178**
Jul-22	1,877	3,609	843	1,760	**8,090**	24	3	769	289	**1,085**	262	80	**342**
Aug-22	1,785	3,132	793	1,658	**7,367**	30	3	718	154	**905**	202	98	**300**
Sep-22	1,725	2,865	650	1,543	**6,783**	14	3	479	236	**732**	267	0	**267**
Oct-22	1,598	2,635	604	1,409	**6,246**	7	3	231	108	**348**	268	0	**268**
Nov-22	1,584	2,713	568	1,435	**6,300**	12	6	193	153	**364**	253	0	**253**
Dec-22	1,586	2,857	561	1,511	**6,516**	13	6	200	432	**651**	260	0	**260**
Jan-23	1,604	3,075	553	1,587	**6,818**	8	3	200	291	**501**	260	0	**260**
Feb-23	1,627	3,211	575	1,648	**7,061**	7	3	180	150	**341**	222	0	**222**
Mar-23	1,675	3,353	572	1,689	**7,289**	8	3	200	184	**395**	265	0	**265**
Apr-23	1,793	3,601	800	1,725	**7,919**	15	3	327	205	**550**	134	0	**134**
May-23	1,675	3,354	975	1,868	**7,872**	31	3	681	287	**1,001**	184	0	**184**
Jun-23	1,532	3,040	975	1,938	**7,485**	13	3	706	184	**907**	178	0	**178**
Jul-23	1,363	2,623	801	1,878	**6,665**	21	3	755	325	**1,104**	245	0	**245**
Aug-23	1,274	2,140	434	1,772	**5,619**	26	3	713	475	**1,217**	123	91	**214**
Sep-23	1,235	1,949	387	1,663	**5,234**	14	3	387	154	**558**	265	95	**360**
Oct-23	976	1,885	451	1,484	**4,796**	12	3	219	128	**362**	171	35	**206**
Nov-23	957	1,911	429	1,493	**4,790**	12	6	193	82	**293**	93	0	**93**
Dec-23	941	1,900	380	1,516	**4,737**	12	6	233	108	**360**	160	0	**160**
Jan-24	927	1,937	367	1,543	**4,774**	8	3	200	61	**272**	259	0	**259**
Feb-24	976	2,097	417	1,566	**5,056**	7	3	187	43	**240**	243	0	**243**
Mar-24	973	2,107	407	1,564	**5,051**	8	2	231	46	**287**	103	0	**103**
Apr-24	859	1,900	416	1,514	**4,689**	15	2	505	45	**566**	59	0	**59**
May-24	605	1,703	410	1,425	**4,141**	31	2	549	61	**642**	184	0	**184**
Jun-24	500	1,347	354	1,373	**3,574**	35	2	563	90	**690**	5	0	**5**
Jul-24	391	993	285	1,285	**2,953**	38	2	584	108	**732**	4	0	**4**
Aug-24	347	653	259	1,151	**2,411**	33	2	508	61	**605**	6	0	**6**
Sep-24	279	550	238	1,119	**2,185**	14	2	317	59	**392**	182	0	**182**
Oct-24	253	550	158	1,055	**2,015**	7	2	188	37	**233**	136	0	**136**
Nov-24	322	688	191	1,069	**2,270**	12	4	178	48	**242**	100	0	**100**
Dec-24	370	798	248	1,091	**2,508**	12	4	184	49	**250**	259	0	**259**
Jan-25	422	933	286	1,115	**2,755**	8	2	184	31	**225**	259	0	**259**
Feb-25	693	2,219	575	1,252	**4,739**	16	2	167	214	**399**	234	0	**234**
Mar-25	828	2,564	620	1,336	**5,348**	8	3	184	184	**380**	263	0	**263**
Apr-25	1,000	3,289	800	1,364	**6,453**	15	3	297	259	**574**	213	0	**213**
May-25	925	3,367	975	1,497	**6,763**	31	3	430	286	**750**	184	0	**184**
Jun-25	770	3,249	688	1,581	**6,288**	13	3	501	466	**983**	178	0	**178**
Jul-25	701	2,682	320	1,534	**5,237**	16	3	768	490	**1,277**	132	88	**220**
Aug-25	665	2,020	310	1,443	**4,438**	19	3	834	119	**974**	189	0	**189**
Sep-25	592	1,900	240	1,341	**4,073**	14	3	362	173	**552**	264	113	**377**
Oct-25	629	2,081	435	1,264	**4,409**	7	3	282	99	**391**	165	0	**165**
Nov-25	624	2,084	310	1,273	**4,291**	12	6	251	210	**479**	140	0	**140**
Dec-25	642	2,079	320	1,286	**4,328**	12	6	255	83	**357**	182	0	**182**
Jan-26	643	2,128	323	1,302	**4,397**	8	3	200	61	**272**	259	0	**259**
Feb-26	787	2,855	534	1,377	**5,553**	8	3	180	42	**232**	235	0	**235**
Mar-26	890	3,063	570	1,419	**5,942**	8	3	200	92	**303**	260	0	**260**
Apr-26	1,000	3,421	800	1,446	**6,666**	15	3	297	126	**441**	262	0	**262**
May-26	850	3,296	753	1,396	**6,295**	31	3	440	138	**612**	184	0	**184**
Jun-26	707	2,985	514	1,343	**5,549**	30	3	598	280	**912**	141	0	**141**
Jul-26	652	2,528	336	1,218	**4,734**	47	3	640	223	**913**	154	11	**165**
Aug-26	609	1,900	310	1,068	**3,887**	31	3	791	81	**906**	136	0	**136**
Sep-26	500	1,771	318	1,009	**3,599**	14	3	373	59	**449**	252	0	**252**

Table V.11.2
D1641 Results

A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Storage (TAF)					Releases (TAF)					Exports (TAF)		
Date	Trinity	Shasta	Folsom	lew Melone	**Total**	Goodwin	Whiskeytown	Keswick	Natoma	**Total**	Tracy	CVP wheeling	**Total**
Oct-21	1,850	2,737	470	1,007	**6,063**	7	3	383	132	**525**	270	40	**310**
Nov-21	1,837	2,727	443	1,026	**6,033**	13	6	259	108	**386**	224	40	**264**
Dec-21	1,839	2,867	543	1,064	**6,313**	13	6	200	80	**299**	260	0	**260**
Jan-22	1,836	2,981	553	1,103	**6,473**	8	3	200	117	**329**	260	0	**260**
Feb-22	1,850	3,358	575	1,212	**6,994**	22	3	180	328	**533**	236	0	**236**
Mar-22	1,890	3,758	631	1,280	**7,559**	17	3	200	253	**473**	266	0	**266**
Apr-22	1,979	4,195	800	1,249	**8,223**	60	3	327	228	**618**	239	0	**239**
May-22	1,935	4,435	975	1,415	**8,759**	92	3	492	589	**1,176**	239	0	**239**
Jun-22	1,987	4,089	975	1,693	**8,744**	13	3	655	572	**1,243**	272	0	**272**
Jul-22	1,875	3,612	809	1,629	**7,925**	24	3	769	323	**1,119**	278	86	**364**
Aug-22	1,783	3,134	717	1,518	**7,152**	30	3	718	195	**946**	281	42	**323**
Sep-22	1,723	2,868	650	1,407	**6,648**	14	3	479	161	**657**	267	0	**267**
Oct-22	1,598	2,635	604	1,404	**6,240**	15	3	231	108	**357**	268	0	**268**
Nov-22	1,584	2,713	568	1,425	**6,290**	17	6	193	153	**369**	253	0	**253**
Dec-22	1,586	2,857	561	1,497	**6,501**	17	6	200	432	**656**	260	0	**260**
Jan-23	1,604	3,075	553	1,562	**6,794**	17	3	200	291	**511**	260	0	**260**
Feb-23	1,627	3,211	575	1,615	**7,028**	16	3	180	150	**349**	208	0	**208**
Mar-23	1,675	3,353	548	1,647	**7,223**	19	3	200	209	**430**	196	0	**196**
Apr-23	1,793	3,601	800	1,629	**7,824**	73	3	327	181	**585**	252	0	**252**
May-23	1,675	3,354	975	1,698	**7,702**	92	3	681	287	**1,063**	219	0	**219**
Jun-23	1,532	3,040	975	1,756	**7,304**	17	3	706	184	**910**	187	0	**187**
Jul-23	1,363	2,623	821	1,690	**6,497**	21	3	755	304	**1,083**	193	32	**226**
Aug-23	1,274	2,140	723	1,577	**5,714**	26	3	713	205	**947**	171	38	**208**
Sep-23	1,235	1,900	641	1,475	**5,250**	15	3	436	189	**643**	265	58	**323**
Oct-23	976	1,885	403	1,476	**4,740**	24	3	219	176	**422**	232	35	**267**
Nov-23	957	1,911	371	1,479	**4,718**	18	6	193	91	**308**	98	0	**98**
Dec-23	941	1,918	350	1,495	**4,705**	19	6	215	80	**320**	94	0	**94**
Jan-24	927	1,956	338	1,511	**4,732**	19	3	200	61	**283**	259	0	**259**
Feb-24	976	2,115	388	1,524	**5,003**	17	3	187	43	**250**	243	0	**243**
Mar-24	973	2,062	378	1,524	**4,937**	8	2	294	46	**350**	1	0	**1**
Apr-24	811	1,900	387	1,466	**4,564**	29	2	509	45	**584**	126	0	**126**
May-24	569	1,692	381	1,348	**3,989**	55	2	547	61	**666**	91	0	**91**
Jun-24	495	1,306	326	1,245	**3,373**	35	2	562	89	**688**	62	0	**62**
Jul-24	387	951	257	1,199	**2,794**	38	2	584	108	**732**	4	0	**4**
Aug-24	344	612	232	1,077	**2,264**	16	2	508	61	**588**	3	0	**3**
Sep-24	276	550	200	1,058	**2,085**	14	2	317	70	**403**	162	0	**162**
Oct-24	253	550	158	1,058	**2,019**	7	2	188	37	**233**	151	0	**151**
Nov-24	322	688	191	1,071	**2,273**	12	4	178	48	**243**	100	0	**100**
Dec-24	370	798	248	1,093	**2,510**	13	4	184	49	**251**	259	0	**259**
Jan-25	422	933	286	1,117	**2,757**	8	2	184	31	**225**	252	0	**252**
Feb-25	693	2,218	575	1,254	**4,740**	16	2	167	214	**399**	234	0	**234**
Mar-25	828	2,374	400	1,337	**4,939**	11	3	375	404	**793**	219	0	**219**
Apr-25	1,131	3,072	677	1,337	**6,217**	40	3	193	163	**399**	206	0	**206**
May-25	1,000	3,360	870	1,434	**6,664**	52	3	276	268	**599**	168	0	**168**
Jun-25	845	3,252	737	1,512	**6,346**	13	3	491	313	**820**	113	0	**113**
Jul-25	776	2,784	537	1,455	**5,552**	16	3	668	321	**1,009**	119	104	**223**
Aug-25	739	2,355	489	1,356	**4,940**	17	3	600	155	**775**	112	0	**112**
Sep-25	713	2,192	531	1,263	**4,699**	14	3	357	59	**434**	246	0	**246**
Oct-25	629	2,081	382	1,251	**4,343**	23	3	282	153	**461**	228	0	**228**
Nov-25	624	2,109	321	1,258	**4,312**	14	6	226	145	**391**	93	0	**93**
Dec-25	642	2,133	320	1,269	**4,364**	14	6	226	94	**341**	167	0	**167**
Jan-26	643	2,182	323	1,282	**4,431**	11	3	200	61	**275**	259	0	**259**
Feb-26	787	2,908	534	1,355	**5,584**	10	3	180	42	**235**	235	0	**235**
Mar-26	902	3,105	544	1,398	**5,949**	8	3	200	118	**329**	216	0	**216**
Apr-26	1,000	3,474	800	1,411	**6,685**	35	3	297	100	**436**	185	0	**185**
May-26	850	3,346	753	1,341	**6,290**	46	3	443	138	**631**	107	0	**107**
Jun-26	707	3,032	490	1,284	**5,513**	29	3	601	304	**938**	157	0	**157**
Jul-26	652	2,462	320	1,155	**4,588**	46	3	753	215	**1,016**	168	16	**184**
Aug-26	609	1,900	310	1,011	**3,831**	18	3	725	65	**812**	153	0	**153**
Sep-26	500	1,776	318	964	**3,559**	14	3	368	59	**444**	232	0	**232**

Table V.11.3
b(2) Results

A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Storage (TAF)					Releases (TAF)					Exports (TAF)		
Date	Trinity	Shasta	Folsom	New Melones	**Total**	Goodwin	Whiskeytown	Keswick	Natoma	**Total**	Tracy	CVP wheeling	**Total**
Oct-21	1,850	2,737	409	1,007	**6,002**	7	12	374	194	**587**	270	40	**310**
Nov-21	1,837	2,658	340	1,026	**5,861**	13	12	323	150	**497**	254	40	**294**
Dec-21	1,839	2,692	366	1,064	**5,961**	13	12	300	154	**479**	160	0	**160**
Jan-22	1,836	2,750	371	1,103	**6,060**	8	12	246	123	**390**	160	0	**160**
Feb-22	1,850	3,077	575	1,212	**6,713**	22	11	222	147	**401**	236	0	**236**
Mar-22	1,890	3,407	631	1,280	**7,208**	17	12	261	253	**544**	264	0	**264**
Apr-22	1,979	3,836	760	1,249	**7,824**	60	12	327	268	**667**	180	0	**180**
May-22	1,935	4,067	975	1,415	**8,392**	92	12	492	550	**1,146**	46	0	**46**
Jun-22	1,900	3,810	975	1,693	**8,379**	13	9	649	572	**1,243**	261	0	**261**
Jul-22	1,727	3,396	792	1,631	**7,547**	22	9	762	340	**1,133**	282	96	**378**
Aug-22	1,666	2,890	710	1,522	**6,788**	28	3	718	186	**934**	279	32	**312**
Sep-22	1,621	2,610	650	1,411	**6,292**	14	9	472	154	**649**	266	0	**266**
Oct-22	1,598	2,580	558	1,404	**6,139**	15	12	277	154	**458**	268	0	**268**
Nov-22	1,584	2,578	526	1,425	**6,112**	17	12	268	149	**445**	253	0	**253**
Dec-22	1,586	2,639	561	1,497	**6,283**	17	12	277	390	**697**	160	0	**160**
Jan-23	1,604	2,802	553	1,562	**6,521**	17	12	246	291	**566**	160	0	**160**
Feb-23	1,619	2,883	575	1,615	**6,691**	16	11	236	150	**413**	236	0	**236**
Mar-23	1,666	2,981	572	1,647	**6,866**	19	12	235	184	**450**	207	0	**207**
Apr-23	1,770	3,235	800	1,629	**7,435**	73	12	327	205	**618**	180	0	**180**
May-23	1,652	2,992	975	1,697	**7,316**	92	12	669	287	**1,060**	46	0	**46**
Jun-23	1,480	2,718	975	1,756	**6,929**	17	3	697	184	**901**	221	0	**221**
Jul-23	1,280	2,342	837	1,692	**6,152**	18	3	747	288	**1,055**	171	32	**204**
Aug-23	1,156	1,900	753	1,581	**5,390**	24	9	703	191	**927**	162	38	**200**
Sep-23	1,000	1,854	645	1,479	**4,978**	15	9	354	215	**593**	259	43	**302**
Oct-23	976	1,885	403	1,476	**4,740**	24	9	213	176	**422**	232	35	**267**
Nov-23	957	1,908	326	1,479	**4,670**	18	9	193	136	**357**	132	0	**132**
Dec-23	941	1,927	247	1,495	**4,610**	19	9	200	138	**366**	136	0	**136**
Jan-24	927	1,943	185	1,511	**4,566**	19	9	215	111	**354**	159	0	**159**
Feb-24	976	2,083	196	1,524	**4,778**	17	9	201	83	**310**	226	0	**226**
Mar-24	973	2,055	161	1,524	**4,713**	8	9	262	71	**350**	0	0	**0**
Apr-24	805	1,900	194	1,466	**4,366**	29	9	499	23	**560**	45	0	**45**
May-24	565	1,690	220	1,348	**3,823**	55	2	547	31	**635**	88	0	**88**
Jun-24	491	1,297	197	1,245	**3,231**	35	6	566	59	**666**	40	0	**40**
Jul-24	384	941	153	1,199	**2,677**	38	6	580	84	**709**	28	0	**28**
Aug-24	341	601	129	1,077	**2,148**	16	6	504	61	**588**	45	0	**45**
Sep-24	274	550	139	1,058	**2,021**	14	6	312	30	**362**	120	0	**120**
Oct-24	253	550	158	1,058	**2,019**	7	6	200	37	**250**	167	0	**167**
Nov-24	319	664	191	1,071	**2,245**	12	6	193	48	**259**	118	0	**118**
Dec-24	366	753	248	1,093	**2,460**	13	6	200	49	**268**	159	0	**159**
Jan-25	418	868	277	1,117	**2,679**	8	6	200	39	**253**	152	0	**152**
Feb-25	688	2,136	575	1,254	**4,653**	16	6	180	205	**408**	217	0	**217**
Mar-25	823	2,249	400	1,337	**4,809**	11	6	414	404	**836**	262	0	**262**
Apr-25	1,006	3,050	721	1,337	**6,114**	40	6	208	119	**373**	67	0	**67**
May-25	931	3,283	975	1,434	**6,623**	52	6	272	207	**537**	69	0	**69**
Jun-25	777	3,177	819	1,512	**6,284**	13	6	486	335	**840**	135	0	**135**
Jul-25	707	2,714	555	1,455	**5,431**	16	6	661	385	**1,068**	203	81	**284**
Aug-25	672	2,287	418	1,357	**4,734**	16	6	595	244	**862**	187	0	**187**
Sep-25	645	2,121	446	1,263	**4,475**	14	6	357	74	**452**	259	0	**259**
Oct-25	629	2,081	382	1,251	**4,343**	23	6	279	153	**461**	228	0	**228**
Nov-25	624	2,092	338	1,258	**4,312**	14	6	243	128	**391**	93	0	**93**
Dec-25	642	2,117	308	1,269	**4,336**	14	6	226	123	**369**	67	0	**67**
Jan-26	643	2,132	266	1,282	**4,322**	11	6	231	108	**355**	159	0	**159**
Feb-26	787	2,841	440	1,355	**5,424**	10	6	194	78	**287**	217	0	**217**
Mar-26	902	3,004	445	1,398	**5,750**	8	6	231	123	**368**	259	0	**259**
Apr-26	1,000	3,371	757	1,411	**6,539**	36	6	297	45	**384**	150	0	**150**
May-26	850	3,253	695	1,341	**6,139**	46	6	431	154	**637**	46	0	**46**
Jun-26	707	2,950	587	1,288	**5,532**	25	6	587	150	**768**	52	0	**52**
Jul-26	652	2,500	449	1,164	**4,765**	40	6	629	182	**858**	35	0	**35**
Aug-26	609	2,084	330	1,019	**4,042**	20	6	576	173	**775**	60	0	**60**
Sep-26	570	1,900	338	972	**3,780**	14	3	358	59	**434**	226	0	**226**

Table V.11.4 shows the storage, release, and export changes between the WQCP study and D1485 study used to compute the WQCP cost. The D1485 study is the baseline for computing the WQCP cost.

The storage changes in CVP's Trinity, Shasta, Folsom, and New Melones Lake are shown in columns B – E; the total storage changes are shown in column F. The storage change in each month is computed by subtracting the current month's storage difference (WQCP – D1485) from the previous month's storage difference (WQCP – D1485). By sign convention, a negative value in the storage change indicates an increase in storage, and a positive value indicates a decrease (cost) in storage in the WQCP study as compared with the D1485 study. Although the storage change is computed every month, only the October through January storage change values are included in the total cost computation.

The release changes in CVP reservoirs at Goodwin Dam, Whiskeytown Lake, Keswick Rservoir, and Lake Natoma (Nimbus) are shown in columns G – J; the total release changes are shown in column L. The release change is computed by taking the difference between the WQCP and D1485 studies each month. By sign convention, a negative value indicates a decrease in release, and a positive value indicates an increase in release. Although the release change is computed every month, only the February through September values are included in the total cost computation. Column M shows the cumulative of the total release from February through September.

The changes in CVP exports at Tracy Pumping Plant and CVP wheeling are shown in columns N and O; the total export changes are shown in column P. The export change is computed by taking the difference between the WQCP and D1485 studies each month. By sign convention, a positive value indicates a decrease (cost) in export, and a negative value indicates an increase in export.

Column Q shows the total WQCP cost which is the sum of the storage, release, and export changes. In October through January, the total cost is the sum of storage and export changes. In February through September, the total cost is the sum of release and export changes.

Column R shows the total WQCP cost with the 450 taf cap limit.

Column S shows the running (cumulative) total of the WQCP cost without the 450 taf cap. The cumulative total in September is the total CVP WQCP cost for each year without the 450 taf cap.

The running (cumulative) total of the WQCP cost with the 450 taf cap is shown in column T. The running total is computed by adding the current month's total metrics to the previous month's cumulative total cost computed from October of each year. The cumulative total in September is the total CVP WQCP cost capped at 450 taf for each year. This is the total CVP WQCP cost that is charged to the (b)(2) account.

Table V.11.4
WQCP Metrics

A	B	C	D	E	F	G	H	I	J	L	M	N	O	P	Q	R	S	T
	Storage (taf)					Releases (taf)						Exports (taf)			Total Cost (taf)	Total cost (taf) w/ 450 cap	Running Total cost	Running Total cost w/ 450 cap
															Oct-Jan: Storage+Export	Oct-Jan: Storage+Export	Oct-Jan: Storage+Export	Oct-Jan: Storage+Export
Date	Trinity	Shasta	Folsom	New Melones	Total	Goodwin	Whiskeytown	Keswick	Natoma	Total	Cumulative Releases	Tracy	CVP Wheeling	Total	Feb-Sep: Release+Export	Feb-Sep: Release+Export	Feb-Sep: Release+Export	Feb-Sep: Release+Export
Oct-21	0	0	0	-3	**-3**	1	0	0	0	**1**		0	0	**0**	-3	-3	-3	-3
Nov-21	0	0	0	1	**1**	1	0	0	0	**1**		0	0	**0**	0	0	-2	-2
Dec-21	0	0	0	1	**1**	1	0	0	0	**1**		0	0	**0**	1	1	-1	-1
Jan-22	0	0	0	1	**1**	1	0	0	0	**1**		0	0	**0**	1	1	-1	-1
Feb-22	0	0	0	0	**0**	0	0	0	0	**0**	**0**	0	0	**0**	0	0	-1	-1
Mar-22	0	0	0	7	**7**	10	0	0	0	**10**	**10**	0	0	**0**	10	10	9	9
Apr-22	0	0	0	41	**41**	46	0	0	0	**46**	**55**	0	0	**0**	46	46	55	55
May-22	0	0	0	65	**65**	62	0	0	0	**62**	**117**	-55	0	**-55**	7	7	62	62
Jun-22	2	-2	0	9	**9**	0	0	0	0	**0**	**117**	-93	0	**-93**	-93	-93	-32	-32
Jul-22	0	0	34	8	**42**	0	0	0	34	**34**	**151**	-16	-7	**-22**	12	12	-20	-20
Aug-22	0	0	41	9	**50**	0	0	0	42	**42**	**193**	-79	57	**-23**	19	19	-1	-1
Sep-22	0	0	-75	-4	**-79**	0	0	0	-75	**-75**	**117**	0	0	**0**	-75	-75	-76	-76
Oct-22	0	0	0	5	**5**	9	0	0	0	**9**		0	0	**0**	5	5	5	5
Nov-22	0	0	0	5	**5**	5	0	0	0	**5**		0	0	**0**	5	5	10	10
Dec-22	0	0	0	5	**5**	5	0	0	0	**5**		0	0	**0**	5	5	15	15
Jan-23	0	0	0	10	**10**	10	0	0	0	**10**		0	0	**0**	10	10	25	25
Feb-23	0	0	0	9	**9**	9	0	0	0	**9**	**9**	13	0	**13**	22	22	47	47
Mar-23	0	0	25	9	**33**	11	0	0	25	**35**	**44**	70	0	**70**	105	105	152	152
Apr-23	0	0	-25	54	**29**	59	0	0	-24	**34**	**78**	-119	0	**-119**	-84	-84	68	68
May-23	0	0	0	75	**75**	62	0	0	0	**62**	**140**	-34	0	**-34**	27	27	95	95
Jun-23	0	0	0	11	**11**	3	0	0	0	**3**	**143**	-8	0	**-8**	-5	-5	90	90
Jul-23	0	0	-20	7	**-13**	0	0	0	-20	**-20**	**123**	52	-32	**20**	-1	-1	89	89
Aug-23	0	0	-269	7	**-262**	0	0	0	-270	**-270**	**-147**	-48	54	**6**	-266	-266	-175	-175
Sep-23	0	49	36	-7	**78**	1	0	49	-34	**85**	**-63**	0	37	**37**	122	122	-54	-54
Oct-23	0	0	48	8	**56**	11	0	0	49	**60**		-61	0	**-61**	-5	-5	-5	-5
Nov-23	0	0	9	6	**15**	6	0	0	9	**15**		-5	0	**-5**	11	11	6	6
Dec-23	0	-18	-28	6	**-40**	6	0	-18	-28	**-40**		65	0	**65**	25	25	31	31
Jan-24	0	0	0	11	**11**	11	0	0	0	**11**		0	0	**0**	11	11	42	42
Feb-24	0	0	0	10	**10**	10	0	0	0	**10**	**10**	0	0	**0**	10	10	53	53
Mar-24	0	63	0	-2	**61**	0	0	63	0	**63**	**74**	102	0	**102**	165	165	218	218
Apr-24	48	-45	0	8	**11**	14	0	4	0	**18**	**92**	-67	0	**-67**	-49	-49	169	169
May-24	-12	11	0	29	**27**	25	0	-1	0	**23**	**115**	94	0	**94**	117	117	286	286
Jun-24	-31	30	-1	51	**49**	0	0	-1	-1	**-2**	**113**	-58	0	**-58**	-59	-59	228	228
Jul-24	-1	1	0	-42	**-43**	0	0	0	0	**0**	**113**	1	0	**1**	0	0	228	228
Aug-24	0	0	0	-11	**-12**	-16	0	0	0	**-17**	**96**	3	0	**3**	-13	-13	213	213
Sep-24	-1	-41	10	-14	**-46**	0	0	0	11	**11**	**107**	21	0	**21**	31	31	244	244
Oct-24	0	0	0	-3	**-3**	0	0	0	0	**0**		-14	0	**-14**	-18	-18	-18	-18
Nov-24	0	0	0	0	**0**	0	0	0	0	**0**		0	0	**0**	0	0	-17	-17
Dec-24	0	0	0	0	**0**	0	0	0	0	**0**		0	0	**0**	0	0	-17	-17
Jan-25	0	0	0	0	**0**	0	0	0	0	**0**		7	0	**7**	7	7	-10	-10
Feb-25	0	0	0	0	**0**	0	0	0	0	**0**	**0**	0	0	**0**	0	0	-10	-10
Mar-25	0	190	220	1	**411**	3	0	190	220	**413**	**413**	44	0	**44**	457	457	448	448
Apr-25	-131	27	-97	27	**-174**	25	0	-104	-96	**-175**	**238**	8	0	**8**	-167	-167	281	281
May-25	-56	-210	-18	36	**-136**	22	0	-154	-18	**-150**	**88**	17	0	**17**	-134	-134	147	147
Jun-25	0	-10	-154	7	**-157**	0	0	-10	-154	**-164**	**-76**	66	0	**65**	-98	-98	49	49
Jul-25	0	-99	-168	9	**-257**	0	0	-99	-169	**-268**	**-344**	13	-16	**-3**	-271	-271	-222	-222
Aug-25	0	-233	38	7	**-188**	-2	0	-234	37	**-200**	**-543**	77	0	**77**	-123	-123	-345	-346
Sep-25	-47	44	-112	-6	**-124**	0	0	-5	-113	**-118**	**-662**	18	113	**131**	13	13	-333	-333
Oct-25	0	0	53	13	**67**	16	0	0	53	**70**		-62	0	**62**	4	4	4	4
Nov-25	0	-25	-65	2	**-88**	2	0	-25	-65	**-88**		47	0	**47**	-41	-41	-37	-37
Dec-25	0	-29	11	2	**-16**	2	0	-29	11	**-16**		15	0	**15**	0	0	-37	-37
Jan-26	0	0	0	3	**3**	3	0	0	0	**3**		0	0	**0**	3	3	-34	-34
Feb-26	0	0	0	2	**2**	2	0	0	0	**2**	**2**	0	0	**0**	2	2	-32	-32
Mar-26	-12	12	26	-2	**24**	1	0	0	26	**26**	**29**	44	0	**44**	70	70	39	39
Apr-26	12	-12	-26	14	**-11**	20	0	0	-26	**-6**	**23**	78	0	**78**	72	72	111	111
May-26	0	3	0	21	**24**	16	0	3	0	**19**	**42**	77	0	**77**	96	96	206	206
Jun-26	0	4	24	3	**31**	-1	0	4	24	**27**	**68**	-15	0	**-15**	11	11	218	218
Jul-26	0	113	-8	5	**110**	-1	0	113	-8	**104**	**172**	-15	-5	**-20**	84	84	302	302
Aug-26	0	-66	-16	-6	**-89**	-12	0	-66	-16	**-94**	**78**	-17	0	**-17**	-111	-111	191	191
Sep-26	0	-5	0	-12	**-17**	0	0	-5	0	**-5**	**73**	20	0	**20**	15	15	206	206

Table V.11.5 shows the computations of storage, release, and export changes for computing the (b)(2) costs in the (b)(2) study as measured against the WQCP study.

The storage changes in CVP's Trinity, Shasta, Folsom, and New Melones Lake are shown in columns B – E; the total storage changes are shown in column F. The storage change in each month is computed by subtracting the current month's storage difference ((b(2) – WQCP) from the previous month's storage difference ((b)(2) – WQCP). By sign convention, a negative value in the storage change indicates an increase in storage, and a positive value indicates a decrease (cost) in storage in the (b)(2) study as compared with the WQCP study. Although the storage change is computed every month, only the October through January storage change is included in the total cost computation.

The release changes in CVP releases at Goodwin Dam, Whiskeytown Lake, Keswick Reservoir, and Lake Natoma (Nimbus) are shown in columns G – J; the total release changes are shown in column K. The release change is computed by taking the difference between the (b)(2) and WQCP studies each month. By sign convention, a negative value indicates a decrease in release, and a positive value indicates an increase in release. Although the release change is computed every month, only the February through September values are included in the total cost computation. Column L shows the cumulative of the total release from February through September.

The changes in CVP exports at Tracy Pumping Plant and CVP wheeling are shown in columns M and N; the total export changes are shown in column O. The change in export is computed by taking the difference between the (b)(2) and WQCP studies each month. By sign convention, a positive value indicates a decrease (cost) in export, and a negative value indicates an increase in export.

Column P shows the total (b)(2) cost, without WQCP cost, and is the sum of the storage, release, and export changes between the (b)(2) and WQCP studies. In October through January, the total cost is the sum of storage and export changes. In February through September, the total cost is the sum of release and export changes.

The running (cumulative) total of the (b)(2) cost is shown in column Q. The cumulative total in September is the total end of year (b)(2) cost, without the WQCP cost, for each year.

Table V.11.5
(b)(2) Metrics

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	Storage (taf)					Releases (taf)						Exports (taf)			Total Cost (taf) Oct-Jan: Storage+Export Feb-Sep: Release+Export	Running Total Cost (taf) Oct-Jan: Storage+Export Feb-Sep: Release+Export
Date	Trinity	Shasta	Folsom	New Melones	Total	Goodwin	Whiskeytown	Keswick	Natoma	Total	Cumulative Releases	Tracy	CVP wheeling	Total		
Oct-21	0	0	61	0	61	0	9	-9	61	61		0	0	0	61	61
Nov-21	0	69	41	0	111	0	6	63	42	111		-30	0	-30	81	142
Dec-21	0	106	74	0	180	0	6	100	74	180		100	0	100	280	422
Jan-22	0	55	6	0	61	0	9	46	6	61		100	0	100	161	583
Feb-22	0	50	-182	0	-132	0	8	42	-182	-132	-132	0	0	0	-132	451
Mar-22	0	70	0	0	70	0	9	61	0	71	61	1	0	1	72	523
Apr-22	0	8	40	0	48	0	9	0	40	49	-12	58	0	59	108	630
May-22	0	8	-40	0	-32	0	9	0	-40	-30	-43	193	0	193	163	793
Jun-22	87	-89	0	0	-2	0	6	-7	0	-1	-44	11	0	11	10	803
Jul-22	61	-64	17	-2	12	-2	6	-7	17	14	-30	-4	-9	-14	0	803
Aug-22	-31	29	-10	-2	-13	-2	0	-1	-9	-12	-42	2	9	11	0	803
Sep-22	-15	14	-7	0	-9	0	6	-6	-7	-8	-49	1	0	1	-7	796
Oct-22	0	55	46	0	101	0	9	46	46	101		0	0	0	101	101
Nov-22	0	80	-4	0	76	0	6	74	-4	76		0	0	0	76	177
Dec-22	0	83	-42	0	41	0	6	77	-42	41		100	0	100	141	318
Jan-23	0	55	0	0	55	0	9	46	0	55		100	0	100	155	473
Feb-23	8	55	0	0	64	0	8	56	0	64	64	-28	0	-28	36	509
Mar-23	0	44	-25	0	20	0	9	35	-25	20	84	-11	0	-11	9	518
Apr-23	15	-7	25	0	33	0	9	0	24	33	117	73	0	73	106	624
May-23	0	-4	0	1	-3	0	9	-12	0	-3	114	173	0	173	170	794
Jun-23	30	-40	0	0	-10	0	0	-9	0	-9	105	-34	0	-34	-43	751
Jul-23	30	-41	-17	-3	-30	-3	0	-9	-17	-28	77	22	0	22	-6	744
Aug-23	35	-41	-13	-2	-22	-2	6	-11	-13	-20	57	9	0	9	-11	733
Sep-23	117	-184	26	0	-51	0	6	-82	26	-50	7	6	15	21	-29	704
Oct-23	0	0	0	0	0	0	6	-6	0	0		0	0	0	0	0
Nov-23	0	3	46	0	49	0	3	0	46	49		-35	0	-35	14	14
Dec-23	0	-12	58	0	46	0	3	-15	58	46		-42	0	-42	5	19
Jan-24	0	22	49	0	71	0	6	15	49	71		100	0	100	171	189
Feb-24	0	20	39	0	59	0	6	14	40	60	60	17	0	17	77	267
Mar-24	0	-25	24	0	-1	0	7	-32	25	0	59	1	0	1	1	267
Apr-24	5	-7	-23	0	-26	0	7	-9	-22	-24	35	82	0	82	58	325
May-24	-1	2	-32	0	-32	0	0	0	-31	-31	5	3	0	3	-28	297
Jun-24	0	8	-31	0	-24	0	4	3	-30	-22	-17	22	0	22	0	297
Jul-24	-1	1	-25	0	-25	0	4	-4	-23	-23	-40	-24	0	-24	-47	250
Aug-24	0	0	-1	0	-2	0	4	-4	0	0	-40	-42	0	-42	-43	208
Sep-24	-1	-10	-41	0	-52	0	4	-4	-40	-40	-81	42	0	42	1	209
Oct-24	0	0	0	0	0	0	4	12	0	16		-16	0	-16	-16	-16
Nov-24	3	25	0	0	28	0	2	15	0	17		-18	0	-18	10	-6
Dec-24	1	21	0	0	22	0	2	15	0	17		100	0	100	122	116
Jan-25	0	20	9	0	28	0	4	15	9	28		100	0	100	128	244
Feb-25	0	18	-9	0	9	0	4	14	-9	9	9	17	0	17	27	271
Mar-25	0	43	0	0	43	0	3	40	0	43	52	-43	0	-43	0	270
Apr-25	120	-103	-44	0	-26	0	3	15	-44	-26	26	139	0	139	113	383
May-25	-56	54	-61	0	-63	0	3	-4	-61	-62	-36	99	0	99	37	419
Jun-25	0	-2	23	0	21	0	3	-5	23	21	-16	-22	0	-22	-1	418
Jul-25	0	-5	64	0	59	0	3	-7	64	60	44	-84	23	-61	-2	416
Aug-25	0	-2	89	0	86	0	3	-6	89	87	131	-76	0	-75	12	429
Sep-25	0	3	15	0	17	0	3	0	15	18	149	-13	0	-13	5	433
Oct-25	0	0	0	0	0	0	3	-3	0	0		0	0	0	0	0
Nov-25	0	17	-17	0	0	0	0	17	-17	0		0	0	0	0	0
Dec-25	0	0	29	0	28	0	0	0	29	28		100	0	100	128	128
Jan-26	0	34	46	0	80	0	3	31	46	80		100	0	100	180	308
Feb-26	0	17	36	0	53	0	3	14	36	53	53	17	0	17	70	378
Mar-26	0	34	5	0	38	0	3	31	6	39	91	-43	0	-43	-5	374
Apr-26	0	3	-56	0	-53	0	3	0	-55	-52	39	35	0	35	-17	356
May-26	0	-10	15	0	5	0	3	-12	15	6	45	61	0	61	67	423
Jun-26	0	-12	-165	-4	-171	-4	3	-14	-155	-170	-125	105	0	105	-66	358
Jul-26	0	-121	-32	-5	-157	-5	3	-123	-33	-158	-284	133	16	149	-9	348
Aug-26	0	-145	108	2	-35	1	3	-149	108	-37	-320	93	0	93	56	404
Sep-26	-70	60	0	0	-9	0	0	-10	0	-10	-330	6	0	6	-4	400

Table V.11.6 shows the total combined (b)(2) and WQCP costs.

The combined storage changes ((b)(2) + WQCP) are shown in columns B – E. The sum of the total combined storage changes for all the reservoirs are shown in column F.

The combined release changes ((b)(2) + WQCP) are shown in columns G – J. The sum of the total combined release changes for all reservoir releases are shown in column K.

Column L shows the cumulative combined (b)(2) and WQCP release changes.

Column M shows the cumulative combined (b)(2) and WQCP releases changes with offset adjustments. Column M is equal to Column L + Column O.

Column N shows the offset adjustment. The offset adjustment is the quantity of water needed to keep the change in cumulative releases from going negative in the February through September period.

The combined export changes ((b)(2) + WQCP) are shown in columns P and Q. The sum of total combined export changes are shown in column R.

Column S shows the total (b)(2) + WQCP costs and is the sum of the combined (b)(2) + WQCP storage, export, and release changes. In October through January, the total combined (b)(2) + WQCP cost is the sum of the combined (b)(2) and WQCP storage and export changes. In February through September, the total combined (b)(2) + WQCP cost is the sum of the combined (b)(2) + WQCP release and export changes and offset adjustements.

The running (cumulative) total of combined (b)(2) and WQCP cost **without** the 450 taf WQCP cost cap is shown in column T. The running total is computed as the sum of the previous month's running total from October and the current month's total combined costs. The running total at the end of September of each year is the total (b)(2) cost without the 450 taf WQCP cap.

The running (cumulative) total of combined (b)(2) and WQCP costs **with** the 450 taf WQCP cap is shown in column U. The running total is computed as the sum of the current month's total combined b(2) + WQCP cost and the running total of the WQCP cost with 450 taf cap. The running total at the end of September of each year is the total (b)(2) cost with WQCP cost capped at 450 taf.

Table V.11.6

Total Metrics ((b)(2) + WQCP)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
	Storage (taf)					Releases (taf)					Offset Computation				Exports (taf)			Total Cost (taf)	Running Total Cost w/o 450 cap (taf)	Running Total Cost w/ 450 cap (taf)
Date	Trinity	Shasta	Folsom	New Melones	Total	Goodwin	Whiskeytown	Keswick	Natoma	Total	Cumulative (b)(2) and WQCP Releases (Feb-Sep)	Cumulative Release w/ Offset adjustment	Offset adjustment	Cumulative Offset	Tracy	CVP Wheeling	Total	Oct-Jan: Storage+Export Feb-Sep: Release+Export+Offset	Oct-Jan: Storage+Export Feb-Sep: Release+Export+Offset	Oct-Jan: Storage+Export Feb-Sep: Release+Export+Offset
Oct-21	0	0	61	-3	**59**	1	9	-9	61	**62**	**I**	**0**	**0**	**0**	0	0	**0**	59	59	59
Nov-21	0	69	41	1	**112**	1	6	63	42	**112**	**I**	**0**	**0**	**0**	-31	0	**-31**	81	140	140
Dec-21	0	100	74	1	**181**	1	6	100	74	**181**	**I**	**0**	**0**	**0**	100	0	**100**	281	420	420
Jan-22	0	55	6	1	**62**	1	9	45	6	**62**	**I**	**0**	**0**	**0**	100	0	**100**	161	582	582
Feb-22	0	50	-182	1	**-132**	0	8	42	-182	**-132**	**-132**	**0**	**132**	**132**	0	0	**0**	0	582	582
Mar-22	0	70	0	7	**78**	10	9	61	0	**80**	**-52**	**0**	**80**	**52**	1	0	**1**	1	583	583
Apr-22	0	8	40	41	**89**	45	9	1	40	**94**	**-43**	**43**	**52**	**0**	59	0	**59**	102	685	685
May-22	0	8	-40	65	**34**	62	9	1	-40	**31**	**74**	**74**	**0**	**0**	138	0	**138**	189	855	855
Jun-22	89	-91	0	9	**7**	0	6	-7	0	**-1**	**73**	**73**	**0**	**0**	-82	0	**-82**	-83	772	772
Jul-22	61	-64	51	6	**54**	-2	6	-7	51	**48**	**121**	**121**	**0**	**0**	-20	-16	**-36**	12	783	783
Aug-22	-31	29	32	7	**36**	-2	0	-1	32	**30**	**151**	**151**	**0**	**0**	-78	86	**-11**	19	802	802
Sep-22	-15	14	-83	-4	**-88**	0	6	-6	-83	**-83**	**68**	**68**	**0**	**0**	1	0	**1**	-82	720	720
Oct-22	0	55	46	5	**106**	9	9	45	45	**110**	**I**	**0**	**0**	**0**	0	0	**0**	106	106	106
Nov-22	0	80	-4	5	**81**	5	6	74	-4	**81**	**I**	**0**	**0**	**0**	0	0	**0**	81	188	188
Dec-22	0	69	-42	5	**45**	5	6	77	-42	**45**	**I**	**0**	**0**	**0**	100	0	**100**	145	333	333
Jan-23	0	55	0	10	**65**	10	9	45	0	**65**	**I**	**0**	**0**	**0**	100	0	**100**	165	498	498
Feb-23	8	55	0	9	**72**	9	8	55	0	**73**	**73**	**73**	**0**	**0**	-14	0	**-14**	59	556	556
Mar-23	0	44	0	9	**53**	11	9	35	0	**56**	**128**	**128**	**0**	**0**	58	0	**58**	114	670	670
Apr-23	15	-7	0	54	**62**	59	9	1	0	**68**	**196**	**196**	**0**	**0**	-45	0	**-45**	22	692	692
May-23	0	-4	0	76	**72**	62	9	-12	0	**59**	**255**	**255**	**0**	**0**	138	0	**138**	197	889	889
Jun-23	30	-40	0	11	**1**	3	0	-9	0	**-6**	**249**	**249**	**0**	**0**	-42	0	**-42**	-48	841	841
Jul-23	30	-41	-37	4	**-43**	-3	0	-9	-37	**-49**	**200**	**200**	**0**	**0**	74	-32	**41**	-7	833	833
Aug-23	35	-41	-283	5	**-284**	-2	6	-11	-384	**-391**	**-90**	**0**	**90**	**90**	-40	54	**14**	-186	647	647
Sep-23	117	-144	82	-8	**47**	1	6	-32	60	**35**	**-56**	**0**	**-35**	**56**	6	52	**58**	58	705	705
Oct-23	0	0	48	8	**56**	11	6	-6	89	**99**	**I**	**0**	**0**	**0**	-61	0	**-61**	-5	-5	-5
Nov-23	0	3	55	6	**64**	6	3	1	55	**64**	**I**	**0**	**0**	**0**	-39	0	**-39**	25	20	20
Dec-23	0	-30	30	6	**6**	6	3	-34	30	**6**	**I**	**0**	**0**	**0**	24	0	**24**	30	50	50
Jan-24	0	22	49	11	**82**	11	6	15	49	**82**	**I**	**0**	**0**	**0**	100	0	**100**	182	232	232
Feb-24	0	20	39	10	**70**	10	6	14	40	**70**	**70**	**70**	**0**	**0**	17	0	**17**	88	319	319
Mar-24	0	38	24	-2	**60**	0	7	31	25	**63**	**133**	**133**	**0**	**0**	103	0	**103**	166	485	485
Apr-24	53	-62	-23	8	**-14**	14	7	-6	-22	**-6**	**127**	**127**	**0**	**0**	15	0	**15**	8	493	493
May-24	-14	12	-33	28	**-5**	25	0	-1	-31	**-7**	**120**	**120**	**0**	**0**	97	0	**97**	89	583	583
Jun-24	-31	38	-33	-51	**25**	0	4	3	-31	**-24**	**96**	**96**	**0**	**0**	-35	0	**-35**	-59	523	523
Jul-24	-2	2	-25	-42	**-67**	0	4	-4	-23	**-23**	**72**	**72**	**0**	**0**	-24	0	**-24**	-47	476	476
Aug-24	0	-1	-2	-11	**-14**	-16	4	-6	0	**-17**	**56**	**56**	**0**	**0**	-39	0	**-39**	-56	421	421
Sep-24	-2	-61	-31	-14	**-108**	0	4	-4	-30	**-30**	**26**	**26**	**0**	**0**	63	0	**63**	33	453	453
Oct-24	0	0	0	-3	**-3**	0	4	12	0	**16**	**I**	**0**	**0**	**0**	-31	0	**-31**	-34	-34	-34
Nov-24	3	25	0	1	**28**	0	2	15	0	**17**	**I**	**0**	**0**	**0**	-18	0	**-18**	10	-24	-24
Dec-24	1	21	0	1	**23**	0	2	15	0	**18**	**I**	**0**	**0**	**0**	100	0	**100**	123	99	99
Jan-25	0	20	9	1	**29**	0	4	15	9	**29**	**I**	**0**	**0**	**0**	107	0	**107**	136	234	234
Feb-25	0	18	-9	1	**9**	0	4	14	-9	**9**	**9**	**9**	**0**	**0**	17	0	**17**	27	261	261
Mar-25	0	233	220	1	**453**	3	3	230	220	**456**	**445**	**445**	**0**	**0**	1	0	**1**	457	718	718
Apr-25	-11	-76	-141	28	**-200**	25	3	-89	-140	**-201**	**264**	**264**	**0**	**0**	146	0	**146**	-55	664	664
May-25	0	-156	-79	35	**-199**	22	3	-158	-79	**-212**	**52**	**52**	**0**	**0**	115	0	**115**	-97	566	566
Jun-25	0	-12	-131	7	**-136**	0	3	-15	-131	**-143**	**-91**	**0**	**91**	**91**	43	0	**43**	-8	558	558
Jul-25	0	-104	-104	9	**-198**	0	3	-107	-105	**-208**	**300**	**0**	**208**	**300**	-71	7	**-64**	-64	494	494
Aug-25	0	-255	127	7	**-102**	-2	3	-239	125	**-113**	**413**	**0**	**113**	**413**	2	0	**2**	2	496	496
Sep-25	-48	46	-99	-8	**-107**	0	3	-5	-99	**-108**	**513**	**0**	**100**	**513**	5	113	**118**	118	614	614
Oct-25	0	0	53	13	**67**	16	3	-3	53	**70**	**I**	**0**	**0**	**0**	-62	0	**-62**	4	4	4
Nov-25	0	-8	-82	2	**-88**	2	0	-8	-82	**-88**	**I**	**0**	**0**	**0**	47	0	**47**	-41	-37	-37
Dec-25	0	-29	40	2	**13**	2	0	-29	40	**13**	**I**	**0**	**0**	**0**	115	0	**115**	128	91	91
Jan-26	0	34	46	3	**83**	3	3	31	45	**82**	**I**	**0**	**0**	**0**	100	0	**100**	183	274	274
Feb-26	0	17	36	2	**55**	2	3	14	36	**55**	**55**	**55**	**0**	**0**	17	0	**17**	72	347	347
Mar-26	-12	46	30	-2	**62**	1	3	31	31	**65**	**120**	**120**	**0**	**0**	1	0	**1**	66	412	412
Apr-26	12	-8	-82	16	**-64**	21	3	1	-81	**-58**	**62**	**62**	**0**	**0**	112	0	**112**	55	467	467
May-26	0	-7	16	20	**29**	15	3	-10	15	**24**	**87**	**87**	**0**	**0**	138	0	**138**	163	630	630
Jun-26	0	-8	-131	-1	**-140**	-5	3	-11	-131	**-144**	**-57**	**0**	**57**	**57**	90	0	**90**	3	633	633
Jul-26	0	-8	-40	-1	**-48**	-7	3	-11	-40	**-54**	**-112**	**0**	**54**	**112**	119	11	**129**	129	762	762
Aug-26	0	-211	82	-5	**-124**	-11	3	-215	92	**-131**	**243**	**0**	**131**	**243**	76	0	**76**	76	838	838
Sep-26	-70	55	0	-12	**-26**	0	0	-15	0	**-15**	**-258**	**0**	**15**	**258**	26	0	**26**	26	864	864

VI Appendix A: Comparison of Regulatory Standards, Actions and Operational Constraints

	D1485	WQCP	WQCP + B2	WQCP + B2+ EWA
	Trinity River			
Minimum req't instream flow	369-815 taf/year, depending on Trinity River Index	same	same	same
	Clear Creek			
Minimum req't instream flow	1963 USBR proposal to FWS: 50-100 cfs	same as D1485 plus	same as D1485 plus CVPIA (b2) AFRP Upstream Action #1 (Nov. 20, 1997): Oct – Sep With stability criteria	same as D1485 plus CVPIA (b2) AFRP Upstream Action #1 (Nov. 20, 1997): Oct – Sep With stability criteria
	Sacramento River			
Minimum req't instream flow below Keswick	1993 Winter-run Biological Opinion with estimated temperature control flows in Apr – Sep. These flows are a proxy for temp. control and do not guarantee meeting the temp. objectives	same	Same as D1485 plus CVPIA (b2) AFRP Upstream Action #2 (Nov. 20, 1997): Oct – Sep With stability criteria	same as D1485 plus CVPIA (b2) AFRP Upstream Action #2 (Nov. 20, 1997): Oct – Sep With stability criteria
<u>Shasta Storage</u>: End-of-Sep. minimum storage	1900 taf, 1993 Winter-run Biological Opinion	same	same	same
Navigation Control Point (NCP)	Flow objective:3500-5000 cfs	same	same	same
	American River			
Minimum req't instream flow at Nimbus	500-2750 cfs (Oct) 500-2500 cfs (Nov) 500-3000 cfs (Dec-Feb) 250-3000 cfs (Mar) 250-3000 cfs (Apr) 500-3000 cfs (May) 1000-3000 cfs (Jun) 750-3000 cfs (Jul) 750-2500 cfs (Aug) 500-2500 cfs (Sep) Flows are dependent on storage and/or and storage + inflow	same	Same as D1485 plus CVPIA (b2) AFRP Upstream Action #3 (Nov. 20, 1997): Oct – Sep With stability criteria	same as D1485 plus CVPIA (b2) AFRP Upstream Action #3 (Nov. 20, 1997): Oct – Sep With stability criteria
Minimum req't instream flow at H Street	SWRCB D893 250-500 cfs, with 25% relaxation in crit.years.	same	same	same

	D1485	WQCP	WQCP + B2	WQCP + B2+ EWA
	Feather River			
Minimum req't instream flow below Thermalito Diversion Dam	600 cfs	same	same	same
Minimum req't instream flow below Thermalito Afterbay	900 – 1700 cfs (Oct. – Feb.) 760 – 1700 cfs (Mar.) 760 – 1000 cfs (Apr. – Sep.), depending on April – July unimpaired runoff in the Feather R. near Oroville	same	same	same
	Lower Sacramento River			
Freeport	None	None	None	None
Minimum req't instream flow at Rio Vista	2500 cfs (Jan - W, AN, BN yrs) 1500 cfs (Jan - D & C yrs) 3000 cfs (Feb1- Mar15, W Yrs) 2000 cfs (Feb1-Mar15, AN & BN yrs) 1000 cfs (Feb1- Mar15, D &C Yrs) 5000 cfs (Mar16-Jun30, W Yrs) 3000 cfs (Mar16-Jun30AN & BN Yrs) 2000 cfs (Mar16-Jun30, D & C Yrs) 3000 cfs (Jul, W Yrs) 2000 cfs (Jul, AN & BN Yrs) 1000 cfs (Jul, D &C Yrs) 1000 cfs (Aug, W, AN, BN, D, C Yrs) 5000 cfs (Sep-Dec, W Yrs) 2500 cfs (Sep-Dec, AN, BN Yrs) 1500 cfs (Sep-Dec, D &C Yrs)	3000 cfs (Sep - all year types) 4000 cfs (Oct-W, AN, BN, D yrs) 3000 cfs (Oct-C Yrs) 4500 cfs (Nov - Dec:W,AN,BN,D yrs) 3500 cfs (Nov -Dec: C Yrs)	Same as WQCP	same as WQCP
	San Joaquin River			
Minimum req't instream flow at Vernalis	None	Vernalis Adaptive Management Plan (VAMP) Target flows: 2000, 3200, 4450, 5700, 7000 cfs (Apr15-May15) Oct. min. flow of 1000 cfs and pulse flow of 28 taf	Same as WQCP	same as WQCP
Salinity standards at Vernalis	700 EC (Apr – Aug) 1000 EC (Sep – Mar) New Melones makes release for salinity. The release cap is 70-225 taf/year based on New Melones forecast inflow	700 EC (Apr – Aug) 1000 EC (Sep – Mar) New Melones makes release for salinity. The release cap is 70-250 taf/year based on New Melones forecast inflow	Same as WQCP	same as WQCP

	D1485	WQCP	WQCP + B2	WQCP + B2+ EWA
	Tuolumne River			
Minimum req't instream flow	FERC 2299-024 1995 90-300 taf/year	same	same	same
	Stanislaus River			
Minimum req't instream flow	98 – 302 taf/year based on New Melones forecast inflow	New Melones Interim Op. Plan 98 – 472 taf/year based on New Melones forecast inflow	Same as WQCP	same as WQCP
CSJWCD Delivery	0-80 taf/year based on New Melones forecast inflow	same	same	same
SEWD Delivery	0-10 taf/year based on New Melones forecast inflow	same	same	same
OID/SSJID Delivery	Qin>600 taf: 600 taf/year Qin<600 taf: Qin + 1/3(600-Qin) Where Qin is the New Melones forecast inflow	200-600 taf/year based on New Melones forecast inflow	Same as WQCP	same as WQCP
Dissolved Oxygen	Jun: 13.2 taf, Jul:16.2 taf, Aug:16.4 taf, Sep:14.3 taf	same	Same	same
	Merced River			
Minimum req't instream flow	35-47 taf/year based on 60-20-20 index	same	Same	same
	Delta			
Delta outflow & salinity	D1485 water quality standards (Artificial Neural Network implementation)	WQCP water quality standards (Artificial Neural Network implementation)	same as WQCP	same as WQCP
Delta Cross Channel Gates	Closed Jan-May when Delta outflow is greater than 12000 cfs Closed when Freeport flow is greater than 25000 cfs. Closed Feb – Apr (1993 Winter-run Biological Opinion)	Closed: 10 days in Nov 15 days in Dec 20 days in Jan Feb. 1 – Jun 4 Closed when Freeport flow is greater than 25,000 cfs.	same as WQCP	same as WQCP

	D1485	WQCP	WQCP + B2	WQCP + B2+ EWA
Delta Export Restrictions	May & Jun: 3000 cfs at Tracy and Banks July: 4600 cfs at Tracy and Banks	Export/Inflow Ratio: 65%: Oct – Jan 35-45%: Feb 35%: Mar – Jun 65%: Jul – Sep When EI controls, allowable pumping is split 50/50 between CVP&SWP 1:1 export criteria - Apr15-May15	same as WQCP plus **B(2) Actions (See Matrix of Potential CVPIA (b)(2) Actions table) only for CVP export.** VAMP Vernalis Flow, cfs — Exports, cfs 2000 — 1500 3200 — 1500 4450 — 1500 5700 — 2250 7000 — 1500 or 3000	same as WQCP + B2 plus **EWA Actions (See Matrix of Potential EWA Actions table) for SWP and CVP export.** VAMP Vernalis Flow, cfs — Exports, cfs 2000 — 1500 3200 — 1500 4450 — 1500 5700 — 2250 7000 — 1500 or 3000
Tracy Pumping	Tracy capacity is assumed at 4600 cfs. However, in some months, it is limited to 4200 cfs by the capacity in the upper DMC.	same	Same	same
	Operations Criteria in Delta			
COA	1986 Agreement between DWR and USBR Storage withdrawals for in-basin use are shared 75% CVP and 25% SWP Unstored flows for storage and export are shared 55% CVP and 45% SWP	same	Same	Same
CVP Wheeling	CVP payback wheeling (196 taf) in Jul and Aug Banks can wheel up to 128 taf/year for Cross Valley Canal Cross Valley Canal delivery is wheeled directly from Banks P.P. from July through December up to CVC's allocation	Banks can wheel up to 128 taf/year for Cross Valley Canal Cross Valley Canal delivery is wheeled directly from Banks P.P. from July through December up to CVC's allocation	Banks can wheel up to 128 taf/year for Cross Valley Canal CVC wheeling is modeled the same as WQCP	Full and unlimited joint point of diversion for CVP and EWA. Note: ESA "take limits", power costs, and other fishery concerns that may inhibit the wheeling of water through the Delta were not modeled. Banks can wheel up to 128 taf/year for Cross Valley Canal CVC wheeling is modeled the same as WQCP